Tidal Propagation Measurements in Foxe Basin

Paul Greisman

Dobrocky Seatech Ltd., Dartmouth, N.S.
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Paul Greisman

Dobrocky SEATECH Ltd.
Suite 48, 1000 Windmill Road
Dartmouth, Nova Scotia
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Paul Greisman

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ABSTRACT

Greisman, P. 1984. Tidal propagation measurements in Foxe Basin. Can. Contract. Rep. Hydrogr. Ocean Sci. 18 : v + 163 p.

Tidal height and current measurements were made in northern Foxe Basin between February and April 1984.

Harmonic analyses of the data reveal strongly progressive tide waves south of Hall Beach. The semi diurnal components propagate clockwise around the basin, while there is a suggestion that the diurnal components propagate anti clockwise.

Tidal currents measured were approximately 0.25 m s^{-1}. A gradual increase in salinity was measured over the period indicating brine drainage due to approximately 1 cm per day ice growth.

RÉSUMÉ

Greisman, P. 1984. Tidal propagation measurements in Foxe Basin. Can. Contract. Rep. Hydrogr. Ocean Sci. 18 : v + 163 p.

On a mesuré les courants et la hauteur de la marée dans la partie nord du bassin Foxe entre février et avril 1984.

Les analyses harmoniques révèlent la présence d'ondes marée très progressives au sud de Hall Beach. Le courant de marée semi-diurne se propage dans le sens des aiguilles d'une montre autour du bassin, tandis qu'il semble que le courant de marée diurne se propage dans le sens contraire des aiguilles d'une montre.

Les courants de marée mesurés étaient d'environ 0.25 m s^{-1}. Au cours de la période considérée, on a constaté une augmentation graduelle de la salinité, due à une formation quotidienne de glace d'environ 1 cm.

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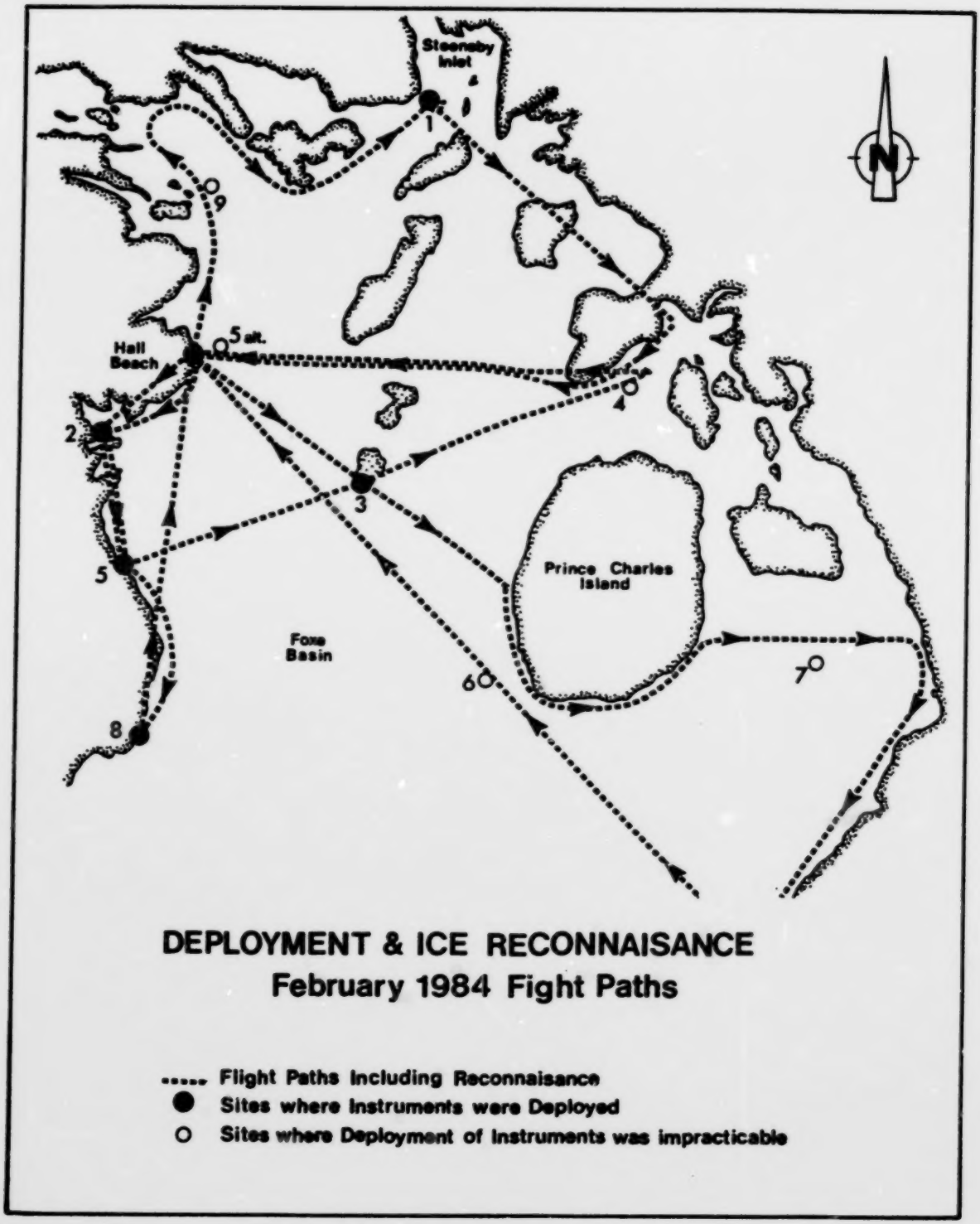
1. SUMMARY

Five tide gauges and two current meters were deployed through the sea ice in north western Foxe Basin in late February 1984 and were recovered in early April 1984. All instruments collected data of good quality. The tides are semi diurnal in character with ranges of approximately 2 m. Tidal currents measured were up to 50 cm s^{-1}.

The tides are of a progressive nature along the western shore. Semi diurnal energy propagates northward while diurnal energy propagates southward. The nature of the tides in Steensby Inlet is nearly that of standing waves. As a result there is nearly a six hour difference in the time of high water between Steensby Inlet and the west coast south of Hall Beach, 350 km distant.



DEPLOYMENT & ICE RECONNAISANCE
February 1984 Fight Paths

..... Flight Paths Including Reconnaisance
● Sites where Instruments were Deployed
○ Sites where Deployment of Instruments was impracticable

FIGURE 1

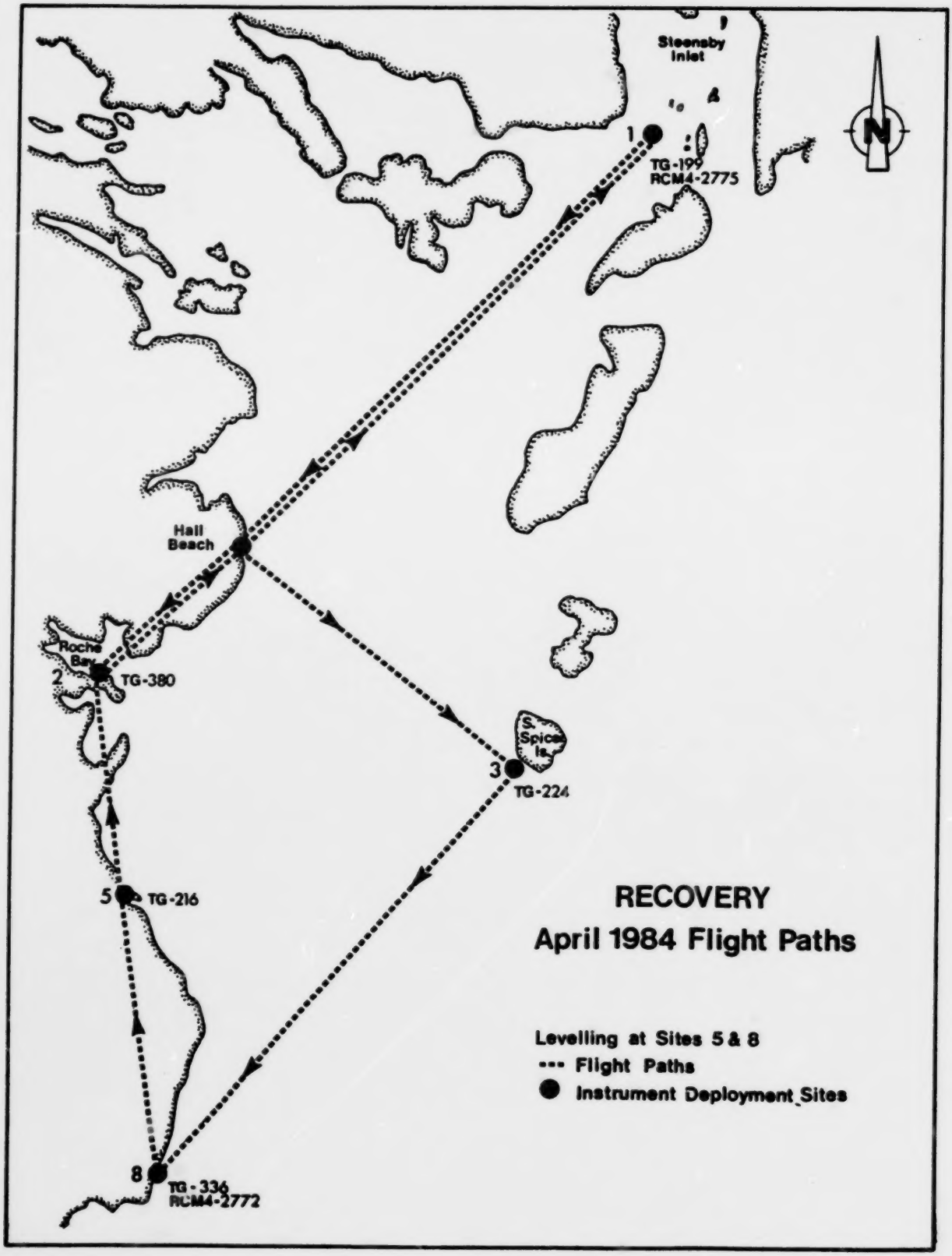

Steensby Inlet
1
TG-199
RCM4-2775
N
Hall Beach
Roche Bay
2
TG-380
S. Spicer Is.
3
TG-224
5
TG-216
8
TG-336
RCM4-2772
RECOVERY
April 1984 Flight Paths
Levelling at Sites 5 & 8
--- Flight Paths
Instrument Deployment Sites

FIGURE 2

2. FIELD PROGRAM

2.1 Deployment

The deployment of the tide gauges and current meters were accomplished at the end of February 1984. A Twin Otter equipped with skis and an Omega navigation was chartered from Bradley-First Air and operated from Hall Beach, NWT. Accommodations at Hall Beach were available at the DEW Line site.

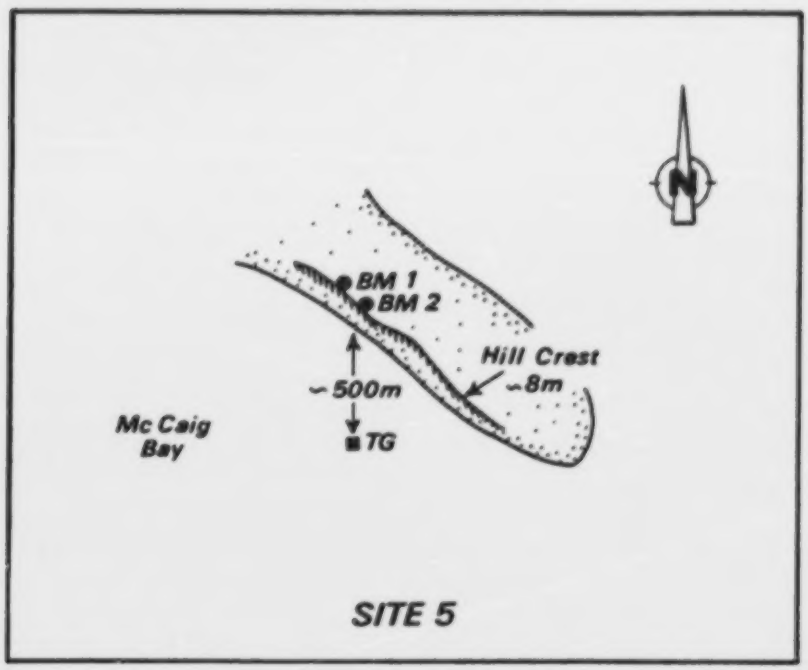
The deployment of the instruments through the sea ice was routine in all aspects except the unfavourable ice conditions. Thin or severely deformed ice precluded landing at some locations while bottom fast ice on the eastern shore made deployment of tide gauges impossible. Of the eight prescribed sites and two alternates, only five sites were deemed stable enough to guarantee recovery. The sites and times at which the instruments were deployed are listed in Table 1. A brief description of the ice conditions was included in the deployment report as well as a narrative of the field activities. These are reproduced here as Appendix I.

2.2 Bench Marks

Bench marks were established at sites 5 and 8. At both these locations reinforcing bars were driven into the rock and marked with flagging tape. Two bench marks were leveled at site 5 and one at site 8. The locations of the bench marks relative to the mooring sites are shown in Figure 3. Leveling between the sea surface and the bench marks was performed after deployment and once again before recovery at the two sites. The details are given below in Table 2. Note: The top of the stake is the levelled point.

TABLE 1. TIDE GAUGE AND CURRENT METER POSITIONS

Site	Latitude	Longitude	Instrument Type	Instrument No.	Water Depth (m)	Instrument Depth (m)	First Good Record (GMT)	Last Good Record (GMT)	Sampling interval (minutes)	Record Length
1	69°51.6'	78°29.8'	TG3A	199	42.9	42.9	2000 25 Feb 84	0100 15 Mar 84	30	18 days
			RCM4	2775	42.9	5.0	2022 25 Feb 84	1508 07 Apr 84	15	42 days
2	68°23.5'	82°08.9'	WLR5	380	10.2	10.2	1615 21 Feb 84	1900 08 Apr 84	30	47 days
3	68°12.1'	79°05.2'	TG3A	224	3.9	3.9	1600 20 Feb 84	1700 06 Apr 84	30	46 days
4	(68°38'	76°18')	No instruments deployed				- -	- -	-	-
5	67°46.4'	81°45.6'	TG3A	216	23.6	23.6	1930 21 Feb 84	2130 06 Apr 84	30	45 days
6	(67°32'	77°33')	No instruments deployed				- -	- -	-	-
7	(67°28'	73°25')	No instruments deployed				- -	- -	-	-
8	67°06.3'	81°22.9'	WLR5	336	40.0	40.0	2145 21 Feb 84	1845 06 Apr 84	30	45 days
			RCM4	2772	40.0	5.0	2157 21 Feb 84	1932 06 Apr 84	15	45 days



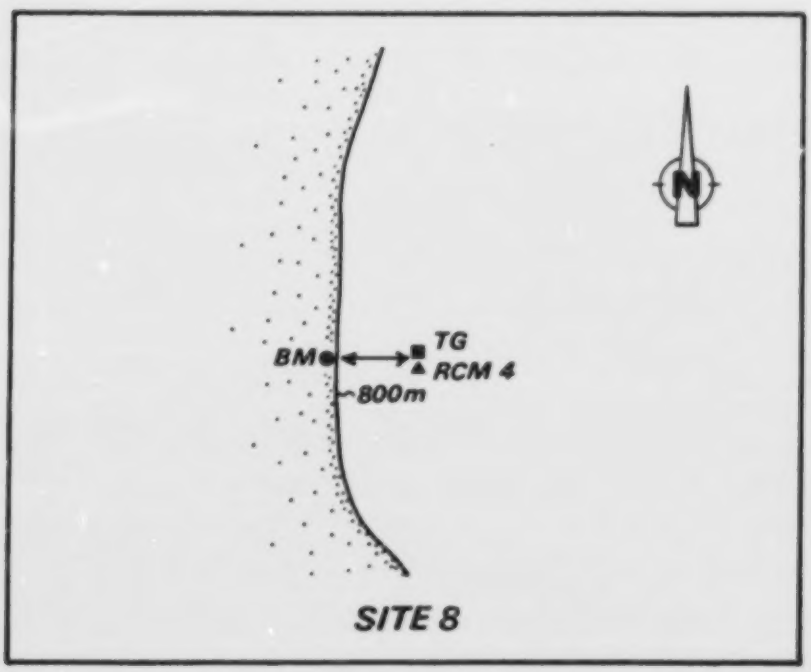


FIGURE 3. Bench Mark Locations

TABLE 2

Bench Mark Elevations

Site 5

2005	21 II 84 GMT	BM #1 : 6.298 m	BM #2 : 6.366 m
2135	06 IV 84 GMT	BM #1 : 5.900 m	BM #2 : 5.975 m

Site 8

2215	21 II 84 GMT	4.362 m
1830	06 IV 84 GMT	5.390 m

The bench marks appear to have been fairly stable over the period between February and April. In particular, the change of level of the bench marks above the sea surface can be compared to the change in sea level recorded by the tide gauges between times of deployment and recovery.

At site 5 the apparent elevation of the bench marks decreased by 0.40 m and 0.39 m between levellings at deployment and recovery. The tidal height difference between these times was + 0.47 m.

At site 8 the apparent elevation change of the bench mark was + 1.03 m while the sea level change was - 1.02 m.

The portions of the tide gauge records corresponding to the times of levelling are reproduced as Table 3.

TABLE 3. TIDAL HEIGHT DATA AT TIMES OF LEVELLING

Aanderaa T63 FOXE BASIN TIDAL SURVEY, 1984
216/ 1 Station: SITE 85 Depth: 22 File: USER:P216.T1

YYYYMMDDHHMM GMT	TEMPERATURE CENT	REL PRESSURE DBAR	TIME CODE	DELTA TIME CODE	Record Number
1984 2211630	4.40	0.10	322.	120.	100
1984 22117 0	3.61	0.10	450.	120.	101
1984 2211730	2.22	-0.15	578.	120.	102
1984 22118 0	1.76	0.13	706.	120.	103
1984 2211830	2.17	-0.21	834.	120.	104
1984 22119 0	-2.78	0.10	962.	120.	105
1984 2211930	-1.82	21.36	66.	-896.	106
1984 22120 0	-2.19	21.54	194.	120.	107
1984 2212030	-2.16	21.66	322.	120.	108
1984 22121 0	-2.04	21.84	450.	120.	109
1984 2212130	-1.95	22.01	578.	120.	110
1984 4 619 0	-1.70	21.49	962.	120.	2265
1984 4 61930	-1.70	21.63	66.	-896.	2266
1984 4 620 0	-1.70	21.73	194.	120.	2267
1984 4 62030	-1.70	21.83	322.	120.	2268
1984 4 621 0	-1.70	21.89	450.	120.	2269
1984 4 62130	-1.69	22.01	578.	120.	2270
1984 4 622 0	-2.03	-1.15	706.	120.	2271
1984 4 62230	-3.69	0.01	834.	120.	2272
1984 4 623 0	4.71	-0.07	962.	120.	2273
1984 4 62330	3.06	0.17	66.	-896.	2274
1984 4 7 0 0	3.20	0.19	194.	120.	2275

TABLE 3. continued

Anderaa WLR5 FOXE BASIN TIDAL SURVEY, 1984
336/ 1 Station: SITE 08 Depth: 37 File: USER:P336.T1

YYYYMMDDHHMM GMT	TEMPERATURE CENT	REL PRESSURE DBAR	REFERENCE	BLOCK	Record Number
1984 2211845	4.29	-0.18	STD.	0.	103
1984 2211915	2.47	-0.05	STD.	0.	104
1984 2211945	0.33	-0.04	STD.	0.	105
1984 2212015	-1.41	-0.03	STD.	0.	106
1984 2212045	4.91	-0.27	STD.	0.	107
1984 2212115	1.27	-0.03	STD.	0.	108
1984 2212145	-1.94	35.69	STD.	0.	109
1984 2212215	-1.90	35.72	STD.	0.	110
1984 2212245	-1.90	35.64	STD.	0.	111
1984 2212315	-1.90	35.44	STD.	0.	112
1984 2212345	-1.90	35.17	STD.	0.	113
1984 4 61545	-1.87	33.55	STD.	0.	2257
1984 4 61615	-1.87	33.68	STD.	0.	2258
1984 4 61645	-1.90	33.85	STD.	0.	2259
1984 4 61715	-1.87	34.09	STD.	0.	2260
1984 4 61745	-1.90	34.34	STD.	0.	2261
1984 4 61815	-1.90	34.59	STD.	0.	2262
1984 4 61845	-1.90	34.80	STD.	0.	2263
1984 4 61915	-2.71	0.11	STD.	0.	2264
1984 4 61945	-2.71	0.11	STD.	0.	2265
1984 4 62015	-2.71	0.12	STD.	0.	2266
1984 4 62045	-2.71	0.11	STD.	0.	2267

2.3 Recovery

All instruments were successfully recovered in early April 1984. Once again a Bradley Twin Otter was chartered and Hall Beach used as the base. Since scouting for suitable sites and ice reconnaissance was not required on the recovery, only about one-half the aircraft time utilized for deployment was needed for recovery. The ice had stabilized between February and April and a fair weather window persisted through the recoveries. However, at the end of the field work bad weather set in and the field party's departure from Hall Beach was delayed about one week. A narrative of the field activities is presented in Appendix II.

3. DATA REDUCTION AND ANALYSIS

3.1 Data Recovery

All instruments functioned properly with the exception of the tide gauge at site 1 which ceased recording on 14 March 1984. Nevertheless, the data from this instrument still permitted the resolution of the major tidal constituents.

3.2 Calibration

Conversion of the raw data to engineering units was accomplished with the use of constants supplied by Aanderaa Instruments, Victoria, for the current meters and the Bedford Institute for the tide gauges. The current meters are calibrated at least once per year on a routine basis. Calibrations for the temperature sensors on the tide gauges were also obtained from Aanderaa with the exception of WLR5 #380 for which no calibration was available. For the calibration of the tide gauges we used the test of applied pressure versus raw data supplied by BIO. We did not compute the period of oscillation of the crystal (a function of pressure) as an intermediate step but rather computed the least squares fit between pressure and instrument output. For the 8 to 13 calibration pairs supplied for each instrument we calculated the polynomial regression for polynomials of degree one through degree five. These regressions are shown in the following pages as Table 4. In the table the two raw data channels (most significant and least significant) are followed by the actual measured pressure (psi) and the pressure computed from the polynomial fit. The last column is the difference between the measured pressure and the computed pressure. In all cases the best fit is attained with a cubic function. The third order polynomial was, therefore, used for calibration of the raw data.

TABLE 4. TIDE GAUGE CALIBRATIONS

*** POLYNOMIAL REGRESSION ***

File USER:T6199.CAL

For a polynomial of degree 1, the coefficients are : A(0) = 0.138483E+03
A(1) = -0.323103E-02

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
1:	31	975	29.7879	32.7667	-2.9788
2:	23	319	59.8142	61.3548	-1.5406
3:	14	618	89.8239	90.1659	-0.3420
4:	5	843	119.8260	119.2161	0.6099
5:	-4	986	149.8400	148.5312	1.3088
6:	-12	29	179.8400	178.0919	1.7481
7:	-21	12	209.8350	207.9240	1.9110
8:	-31	933	239.8470	238.0339	1.8131
9:	-40	746	269.8460	268.4153	1.4307
10:	-49	471	299.8420	299.0810	0.7610
11:	-58	102	329.8500	330.0504	-0.2004
12:	-68	662	359.8570	361.3268	-1.4698
13:	-77	99	389.8720	392.9230	-3.0510

For a polynomial of degree 2, the coefficients are : A(0) = 0.139576E+03
A(1) = -0.330338E-02
A(2) = -0.150795E-08

1:	31	975	29.7879	29.7927	-0.0048
2:	23	319	59.8142	59.8161	-0.0019
3:	14	618	89.8239	89.8222	0.0017
4:	5	843	119.8260	119.8215	0.0045
5:	-4	986	149.8400	149.8342	0.0058
6:	-12	29	179.8400	179.8336	0.0064
7:	-21	12	209.8350	209.8389	-0.0039
8:	-31	933	239.8470	239.8491	-0.0021
9:	-40	746	269.8460	269.8503	-0.0043
10:	-49	471	299.8420	299.8475	-0.0055
11:	-58	102	329.8500	329.8515	-0.0015
12:	-68	662	359.8570	359.8567	0.0003
13:	-77	99	389.8720	389.8667	0.0053

For a polynomial of degree 3, the coefficients are : A(0) = 0.139580E+03
A(1) = -0.330332E-02
A(2) = -0.159586E-08
A(3) = -0.115454E-15

1:	31	975	29.7879	29.7866	0.0013
2:	23	319	59.8142	59.8159	-0.0017
3:	14	618	89.8239	89.8252	-0.0013
4:	5	843	119.8260	119.8259	0.0001
5:	-4	986	149.8400	149.8382	0.0018
6:	-12	29	179.8400	179.8360	0.0040
7:	-21	12	209.8350	209.8392	-0.0042
8:	-31	933	239.8470	239.8472	-0.0002
9:	-40	746	269.8460	269.8466	-0.0006
10:	-49	471	299.8420	299.8431	-0.0010
11:	-58	102	329.8500	329.8480	0.0020
12:	-68	662	359.8570	359.8565	0.0005
13:	-77	99	389.8720	389.8728	-0.0008

TABLE 4. continued

POLYNOMIAL REGRESSION

File USER:T6199.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 4, the coefficients are :				A(0) =	0.139580E+03
				A(1) =	-0.330331E-02
				A(2) =	-0.159506E-08
				A(3) =	-0.119389E-15
				A(4) =	-0.4720T2E-22
1:	31	975	29.7879	29.7866	0.0013
2:	23	319	59.8142	59.8159	-0.0017
3:	14	618	89.8239	89.8253	-0.0014
4:	5	843	119.8260	119.8259	0.0001
5:	-4	906	149.8400	149.8382	0.0018
6:	-12	29	179.8400	179.8360	0.0040
7:	-21	12	209.8350	209.8391	-0.0041
8:	-31	933	239.8470	239.8471	-0.0001
9:	-40	746	269.8460	269.8466	-0.0005
10:	-49	471	299.8420	299.8431	-0.0011
11:	-58	102	329.8500	329.8480	0.0020
12:	-68	662	359.8570	359.8565	0.0005
13:	-77	99	389.8720	389.8727	-0.0007
For a polynomial of degree 5, the coefficients are :				A(0) =	0.139581E+03
				A(1) =	-0.330339E-02
				A(2) =	-0.160230E-08
				A(3) =	-0.576296E-16
				A(4) =	0.500046E-20
				A(5) =	0.446949E-25
1:	31	975	29.7879	29.7878	0.0001
2:	23	319	59.8142	59.8143	-0.0001
3:	14	618	89.8239	89.8243	-0.0004
4:	5	843	119.8260	119.8263	-0.0003
5:	-4	906	149.8400	149.8395	0.0005
6:	-12	29	179.8400	179.8371	0.0029
7:	-21	12	209.8350	209.8393	-0.0043
8:	-31	933	239.8470	239.8462	0.0008
9:	-40	746	269.8460	269.8451	0.0009
10:	-49	471	299.8420	299.8424	-0.0003
11:	-58	102	329.8500	329.8489	0.0011
12:	-68	662	359.8570	359.8583	-0.0014
13:	-77	99	389.8720	389.8716	0.0004

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6216.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 1, the coefficients are :				A(0) = 0.251304E+03 A(1) = -0.333007E-02	
1:	63	969	29.8001	33.3280	-3.5279
2:	55	635	59.8262	61.6536	-1.8274
3:	47	261	89.8339	90.2456	-0.4117
4:	38	885	119.8410	119.1239	0.7171
5:	30	233	149.8490	148.3087	1.5403
6:	21	599	179.8380	177.7798	2.0582
7:	12	865	209.8490	207.5839	2.2651
8:	4	12	239.8480	237.7044	2.1436
9:	-5	86	269.8430	268.1479	1.6951
10:	-14	56	299.8470	298.9377	0.9093
11:	-24	941	329.8550	330.0905	-0.2355
12:	-33	690	359.8630	361.5896	-1.7266
13:	-42	337	389.8020	393.4817	-3.5997
For a polynomial of degree 2, the coefficients are :				A(0) = 0.253379E+03 A(1) = -0.328353E-02 A(2) = -0.195373E-08	
1:	63	969	29.8001	29.8219	-0.0218
2:	55	635	59.8262	59.8283	-0.0021
3:	47	261	89.8339	89.8243	0.0096
4:	38	885	119.8410	119.8223	0.0187
5:	30	233	149.8490	149.8340	0.0150
6:	21	599	179.8380	179.8294	0.0086
7:	12	865	209.8490	209.8460	0.0030
8:	4	12	239.8480	239.8568	-0.0088
9:	-5	86	269.8430	269.8580	-0.0150
10:	-14	56	299.8470	299.8614	-0.0144
11:	-24	941	329.8550	329.8717	-0.0167
12:	-33	690	359.8630	359.8607	0.0023
13:	-42	337	389.8020	389.8604	0.0216
For a polynomial of degree 3, the coefficients are :				A(0) = 0.253369E+03 A(1) = -0.328215E-02 A(2) = -0.197759E-08 A(3) = -0.670017E-15	
1:	63	969	29.8001	29.7993	0.0008
2:	55	635	59.8262	59.8273	-0.0011
3:	47	261	89.8339	89.8357	-0.0018
4:	38	885	119.8410	119.8385	0.0025
5:	30	233	149.8490	149.8489	0.0001
6:	21	599	179.8380	179.8387	-0.0007
7:	12	865	209.8490	209.8474	0.0016
8:	4	12	239.8480	239.8497	-0.0017
9:	-5	86	269.8430	269.8441	-0.0011
10:	-14	56	299.8470	299.8446	0.0024
11:	-24	941	329.8550	329.8583	-0.0033
12:	-33	690	359.8630	359.8596	0.0034
13:	-42	337	389.8020	389.8032	-0.0012

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6216.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 4, the coefficients are :				A(0) =	0.253369E+03
				A(1) =	-0.328276E-02
				A(2) =	-0.197737E-08
				A(3) =	-0.467211E-15
				A(4) =	-0.611602E-22
1:	63	969	29.8001	29.7992	0.0009
2:	55	655	59.8262	59.8273	-0.0011
3:	47	261	89.8339	89.8357	-0.0018
4:	38	805	119.8410	119.8385	0.0025
5:	30	233	149.8490	149.8489	0.0001
6:	21	599	179.8380	179.8386	-0.0006
7:	12	865	209.8490	209.8473	0.0017
8:	4	12	239.8480	239.8497	-0.0017
9:	-5	86	269.8430	269.8440	-0.0011
10:	-14	56	299.8470	299.8447	0.0023
11:	-24	941	329.8550	329.8584	-0.0033
12:	-33	698	359.8630	359.8597	0.0033
13:	-42	337	389.8820	389.8832	-0.0012
For a polynomial of degree 5, the coefficients are :				A(0) =	0.253368E+03
				A(1) =	-0.328272E-02
				A(2) =	-0.197350E-08
				A(3) =	-0.548146E-15
				A(4) =	-0.205420E-20
				A(5) =	0.346393E-25
1:	63	969	29.8001	29.8000	0.0001
2:	55	655	59.8262	59.8262	0.0000
3:	47	261	89.8339	89.8350	-0.0011
4:	38	805	119.8410	119.8388	0.0022
5:	30	233	149.8490	149.8498	-0.0008
6:	21	599	179.8380	179.8394	-0.0014
7:	12	865	209.8490	209.8475	0.0015
8:	4	12	239.8480	239.8491	-0.0010
9:	-5	86	269.8430	269.8431	-0.0001
10:	-14	56	299.8470	299.8442	0.0028
11:	-24	941	329.8550	329.8589	-0.0039
12:	-33	698	359.8630	359.8609	0.0021
13:	-42	337	389.8820	389.8824	-0.0004

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6224.CAL

Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')

For a polynomial of degree 1, the coefficients are : A(0) = 0.247632E+03
A(1) = -0.342977E-02

1:	61	67	29.7045	33.1657	-3.3612
2:	52	1007	59.8142	61.5504	-1.7362
3:	44	048	89.8274	90.1924	-0.3650
4:	36	600	119.8300	119.1122	0.7178
5:	28	283	149.8400	148.3235	1.5165
6:	19	901	179.8300	177.8127	2.0173
7:	11	483	209.8360	207.6174	2.2186
8:	2	842	239.8370	237.7204	2.1166
9:	-6	168	269.8360	268.1288	1.7072
10:	-24	579	329.8500	329.9366	-0.0866
11:	-33	638	359.8550	361.3430	-1.4880
12:	-42	593	389.8690	393.1061	-3.2371

For a polynomial of degree 2, the coefficients are : A(0) = 0.249669E+03
A(1) = -0.339019E-02
A(2) = -0.201048E-08

1:	61	67	29.7045	29.8143	-0.0298
2:	52	1007	59.8142	59.8150	-0.0008
3:	44	048	89.8274	89.8084	0.0190
4:	36	600	119.8300	119.8082	0.0218
5:	28	283	149.8400	149.8201	0.0199
6:	19	901	179.8300	179.8215	0.0085
7:	11	483	209.8360	209.8418	-0.0058
8:	2	842	239.8370	239.8544	-0.0174
9:	-6	168	269.8360	269.8568	-0.0208
10:	-24	579	329.8500	329.8653	-0.0153
11:	-33	638	359.8550	359.8569	-0.0019
12:	-42	593	389.8690	389.8462	0.0228

For a polynomial of degree 3, the coefficients are : A(0) = 0.249653E+03
A(1) = -0.338948E-02
A(2) = -0.190948E-08
A(3) = -0.671119E-15

1:	61	67	29.7045	29.7069	-0.0024
2:	52	1007	59.8142	59.8147	-0.0005
3:	44	048	89.8274	89.8233	0.0041
4:	36	600	119.8300	119.8283	0.0017
5:	28	283	149.8400	149.8377	0.0023
6:	19	901	179.8300	179.8311	-0.0011
7:	11	483	209.8360	209.8405	-0.0045
8:	2	842	239.8370	239.8418	-0.0048
9:	-6	168	269.8360	269.8351	0.0009
10:	-24	579	329.8500	329.8444	0.0056
11:	-33	638	359.8550	359.8523	0.0027
12:	-42	593	389.8690	389.8731	-0.0041

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6224.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 4, the coefficients are :				A(0) =	0.249651E+03
				A(1) =	-0.338931E-02
				A(2) =	-0.198149E-08
				A(3) =	-0.500840E-15
				A(4) =	-0.398519E-20
1:	61	67	29.7045	29.7031	0.0014
2:	52	1007	59.8142	59.8170	-0.0028
3:	44	848	89.8274	89.8269	0.0005
4:	36	608	119.8300	119.8305	-0.0005
5:	28	283	149.8400	149.8375	0.0025
6:	19	901	179.8300	179.8289	0.0011
7:	11	403	209.8360	209.8375	-0.0015
8:	2	842	239.8370	239.8394	-0.0024
9:	-6	168	269.8360	269.8349	0.0011
10:	-24	579	329.8500	329.8488	0.0012
11:	-33	638	359.8550	359.8556	-0.0005
12:	-42	593	389.8690	389.8691	-0.0001
For a polynomial of degree 5, the coefficients are :				A(0) =	0.249650E+03
				A(1) =	-0.338925E-02
				A(2) =	-0.197777E-08
				A(3) =	-0.599761E-15
				A(4) =	-0.592223E-20
				A(5) =	0.391665E-25
1:	61	67	29.7045	29.7039	0.0006
2:	52	1007	59.8142	59.8159	-0.0017
3:	44	848	89.8274	89.8262	0.0012
4:	36	608	119.8300	119.8308	-0.0008
5:	28	283	149.8400	149.8384	0.0016
6:	19	901	179.8300	179.8297	0.0003
7:	11	403	209.8360	209.8375	-0.0015
8:	2	842	239.8370	239.8387	-0.0017
9:	-6	168	269.8360	269.8339	0.0021
10:	-24	579	329.8500	329.8492	0.0009
11:	-33	638	359.8550	359.8566	-0.0016
12:	-42	593	389.8690	389.8684	0.0006

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6336.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 1, the coefficients are :				A(0) =	-0.143778E+03
				A(1) =	0.243033E-02
1:	70	720	29.7462	32.1783	-2.4321
2:	141	303	209.8090	207.8595	1.9495
3:	153	406	239.8220	237.9737	1.8483
4:	165	608	269.8200	268.3285	1.4915
5:	177	920	299.8260	298.9506	0.8754
6:	190	315	329.8320	329.8328	-0.0008
7:	202	849	359.8470	360.9945	-1.1475
8:	215	478	389.8610	392.4454	-2.5844
For a polynomial of degree 2, the coefficients are :				A(0) =	-0.159090E+03
				A(1) =	0.266696E-02
				A(2) =	-0.811048E-09
1:	70	720	29.7462	29.7468	-0.0006
2:	141	303	209.8090	209.8062	0.0028
3:	153	406	239.8220	239.8199	0.0021
4:	165	608	269.8200	269.8214	-0.0014
5:	177	920	299.8260	299.8307	-0.0047
6:	190	315	329.8320	329.8340	-0.0020
7:	202	849	359.8470	359.8434	0.0036
8:	215	478	389.8610	389.8608	0.0002
For a polynomial of degree 3, the coefficients are :				A(0) =	-0.159164E+03
				A(1) =	0.266878E-02
				A(2) =	-0.824133E-09
				A(3) =	0.291757E-16
1:	70	720	29.7462	29.7463	-0.0001
2:	141	303	209.8090	209.8088	0.0003
3:	153	406	239.8220	239.8207	0.0013
4:	165	608	269.8200	269.8206	-0.0006
5:	177	920	299.8260	299.8289	-0.0029
6:	190	315	329.8320	329.8321	-0.0001
7:	202	849	359.8470	359.8427	0.0043
8:	215	478	389.8610	389.8631	-0.0021

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6336.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 4, the coefficients are :				A(0) =	-0.159640E+03
				A(1) =	0.268321E-02
				A(2) =	-0.975600E-09
				A(3) =	0.638928E-15
				A(4) =	-0.106585E-20
1:	70	720	29.7462	29.7462	0.0000
2:	141	303	209.8090	209.8104	-0.0014
3:	153	406	239.8220	239.8198	0.0022
4:	165	608	269.8200	269.8191	0.0009
5:	177	920	299.8260	299.8283	-0.0023
6:	190	315	329.8320	329.8332	-0.0012
7:	202	849	359.8470	359.8444	0.0026
8:	215	478	389.8610	389.8619	-0.0009
For a polynomial of degree 5, the coefficients are :				A(0) =	-0.153273E+03
				A(1) =	0.245381E-02
				A(2) =	0.214768E-08
				A(3) =	-0.197170E-13
				A(4) =	0.636995E-19
				A(5) =	-0.739167E-25
1:	70	720	29.7462	29.7462	0.0000
2:	141	303	209.8090	209.8089	0.0001
3:	153	406	239.8220	239.8224	-0.0004
4:	165	608	269.8200	269.8195	0.0005
5:	177	920	299.8260	299.8262	-0.0002
6:	190	315	329.8320	329.8321	-0.0001
7:	202	849	359.8470	359.8469	0.0001
8:	215	478	389.8610	389.8610	0.0000

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6300.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 1, the coefficients are :				A(0) =	-0.252652E+03
				A(1) =	0.116276E-02
1:	243	214	29.7904	36.5294	-7.1316
2:	265	613	59.8279	63.5881	-3.7602
3:	288	444	89.8382	90.7769	-0.9387
4:	311	752	119.8430	118.5294	1.3226
5:	335	539	149.8530	146.8488	3.0042
6:	359	830	179.8478	175.7632	4.0838
7:	384	638	209.8478	205.3067	4.5403
8:	409	1002	239.8468	235.4966	4.3494
9:	435	913	269.8498	266.3505	3.4985
10:	462	483	299.8458	297.9055	1.9395
11:	489	523	329.8538	330.1931	-0.3401
12:	517	269	359.8520	363.2363	-3.3845
13:	545	690	389.8818	397.0647	-7.1837
For a polynomial of degree 2, the coefficients are :				A(0) =	-0.327164E+03
				A(1) =	0.155578E-02
				A(2) =	-0.488371E-09
1:	243	214	29.7904	30.0052	-0.2068
2:	265	613	59.8279	59.8407	-0.0128
3:	288	444	89.8382	89.7407	0.0975
4:	311	752	119.8430	119.7003	0.1427
5:	335	539	149.8530	149.7176	0.1354
6:	359	830	179.8478	179.7590	0.0890
7:	384	638	209.8478	209.8282	0.0188
8:	409	1002	239.8468	239.9050	-0.0590
9:	435	913	269.8498	269.9629	-0.1139
10:	462	483	299.8458	299.9925	-0.1475
11:	489	523	329.8538	329.9746	-0.1216
12:	517	269	359.8520	359.8788	-0.0268
13:	545	690	389.8818	389.6762	0.2048
For a polynomial of degree 3, the coefficients are :				A(0) =	-0.337639E+03
				A(1) =	0.164048E-02
				A(2) =	-0.794738E-09
				A(3) =	0.178081E-15
1:	243	214	29.7904	29.8045	-0.0061
2:	265	613	59.8279	59.8230	0.0049
3:	288	444	89.8382	89.8335	0.0047
4:	311	752	119.8430	119.8405	0.0025
5:	335	539	149.8530	149.8534	-0.0004
6:	359	830	179.8478	179.8542	-0.0032
7:	384	638	209.8478	209.8528	-0.0050
8:	409	1002	239.8468	239.8523	-0.0063
9:	435	913	269.8498	269.8465	0.0045
10:	462	483	299.8458	299.8408	0.0042
11:	489	523	329.8538	329.8464	0.0066
12:	517	269	359.8520	359.8588	-0.0068
13:	545	690	389.8818	389.8806	0.0005

TABLE 4. continued

*** POLYNOMIAL REGRESSION ***

File USER:T6300.CAL

	Raw Data (X) MSB	LSB	Observed Pressure (Y)	Calculated Pressure (Y')	Difference (Y-Y')
For a polynomial of degree 4, the coefficients are :				A(0) =	-0.338838E+03
				A(1) =	0.165227E-02
				A(2) =	-0.752473E-09
				A(3) =	0.259588E-15
				A(4) =	-0.580008E-22
1:	243	214	29.7984	29.8006	-0.0022
2:	265	613	59.8279	59.8250	0.0029
3:	288	444	89.8382	89.8370	0.0012
4:	311	752	119.8430	119.8430	0.0000
5:	335	539	149.8530	149.8537	-0.0007
6:	359	830	179.8470	179.8483	-0.0013
7:	384	638	209.8470	209.8489	-0.0019
8:	409	1002	239.8460	239.8494	-0.0034
9:	435	913	269.8490	269.8434	0.0056
10:	462	403	299.8450	299.8423	0.0027
11:	489	523	329.8530	329.8501	0.0029
12:	517	269	359.8520	359.8618	-0.0098
13:	545	690	389.8810	389.8769	0.0041
For a polynomial of degree 5, the coefficients are :				A(0) =	-0.344455E+03
				A(1) =	0.172766E-02
				A(2) =	-0.114874E-08
				A(3) =	0.120004E-14
				A(4) =	-0.133842E-20
				A(5) =	0.638708E-27
1:	243	214	29.7984	29.7977	0.0007
2:	265	613	59.8279	59.8287	-0.0008
3:	288	444	89.8382	89.8398	-0.0016
4:	311	752	119.8430	119.8425	0.0006
5:	335	539	149.8530	149.8508	0.0022
6:	359	830	179.8470	179.8454	0.0016
7:	384	638	209.8470	209.8480	-0.0010
8:	409	1002	239.8460	239.8513	-0.0053
9:	435	913	269.8490	269.8468	0.0022
10:	462	403	299.8450	299.8444	0.0006
11:	489	523	329.8530	329.8485	0.0045
12:	517	269	359.8520	359.8573	-0.0054
13:	545	690	389.8810	389.8794	0.0016

3.3 Data Processing

Timing of the records was carefully checked by comparing the start times with precise deployment times and then the number of records between start and immersion. The next check is the proper number of records between immersion and recovery, and the last check is the proper number of records between recovery and off. These checks were made on all instruments with the exception of the tide gauge at site 1 (instrument #199).

The calibrated data on the proper time base were then plotted and obvious spikes removed visually. The veracity of the calibrated data was ensured by comparing water depths measured by sounding with those determined by the tide gauges. In addition, salinities computed from the current meter data were examined for a slow increase in salinity over the time of deployment due to brine drainage, and for temperatures and salinities which are characteristic of surface mixed layers at the freezing point.

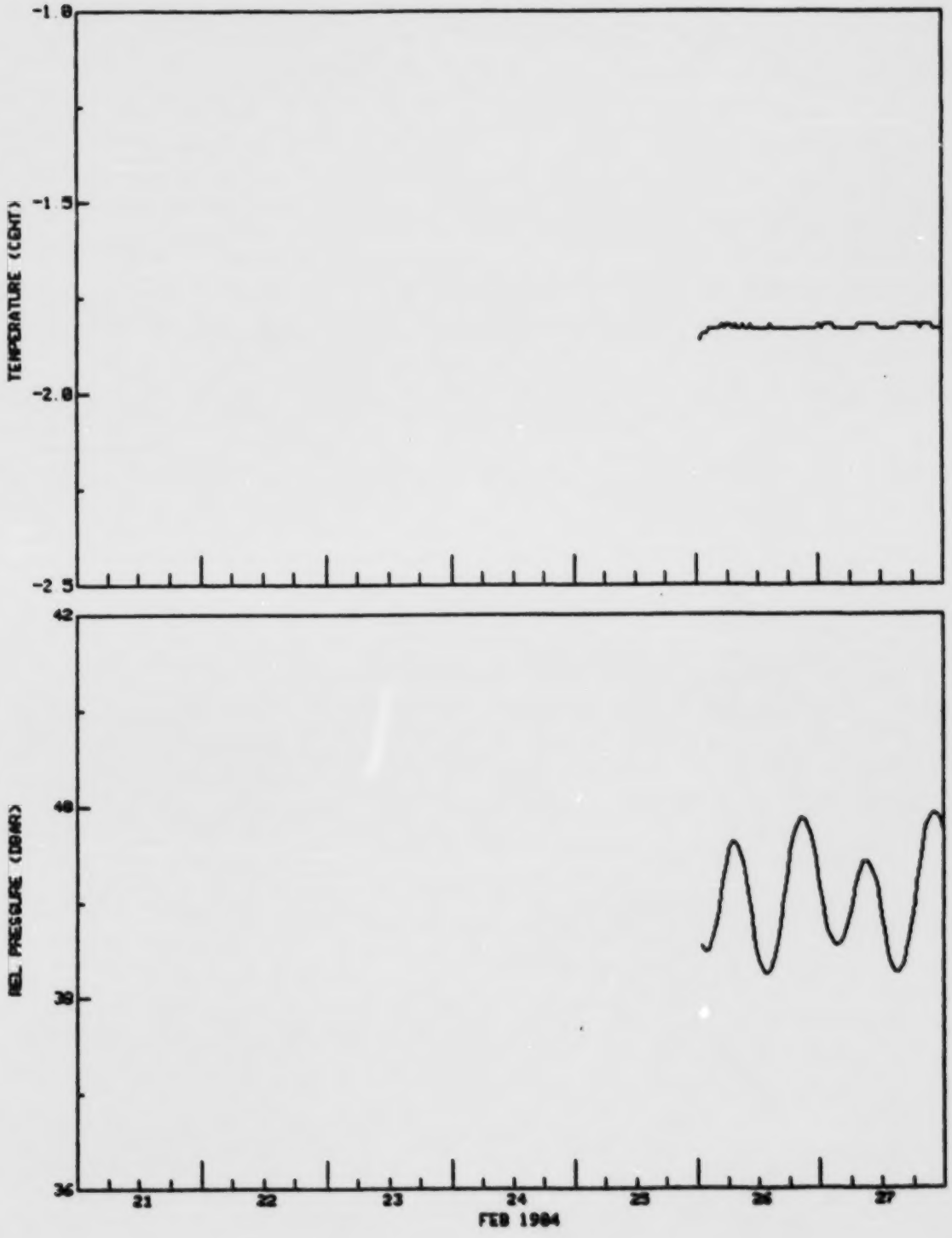
After we assured ourselves that the data were of good quality, then final time series plots were produced along with histograms, stick plots and progressive vector diagrams.

3.4 Tide Gauge and Current Meter Time Series Plots

Time series plots for each of the five tide gauges and two current meters are given on the following pages. Following each of the current meter time series plots are histograms, stick plots and progressive vector diagrams. No temperature calibration for WLR5 no. 380 at site 2 was available from Aanderaa Instruments so that this temperature time series plot has not been produced. In addition the instrument (TG3A, no. 199) at site 1 stopped recording on 14 March 1984, so that this record is truncated.

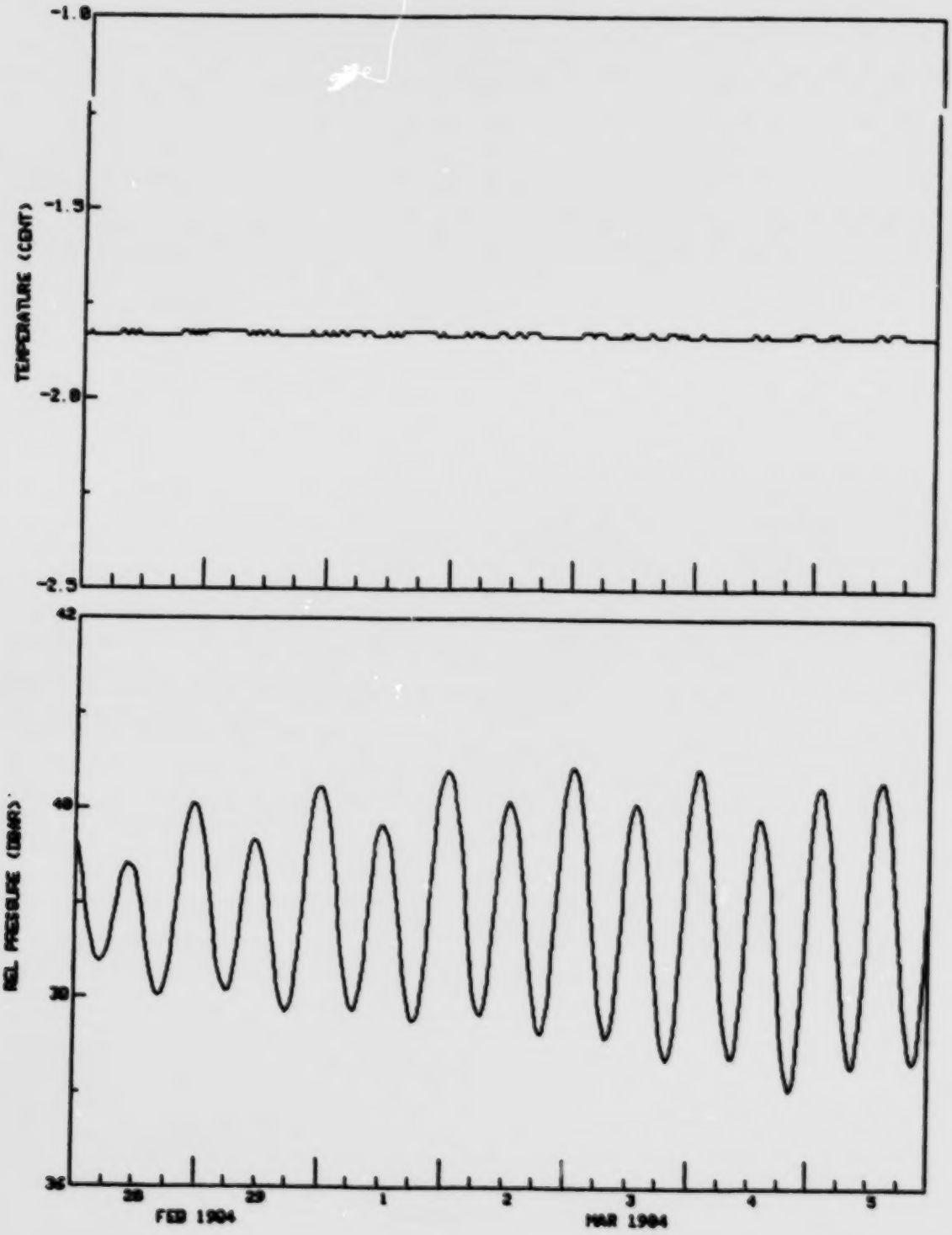
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA TG3A #199 69 51.6 'N 78 29.8'W



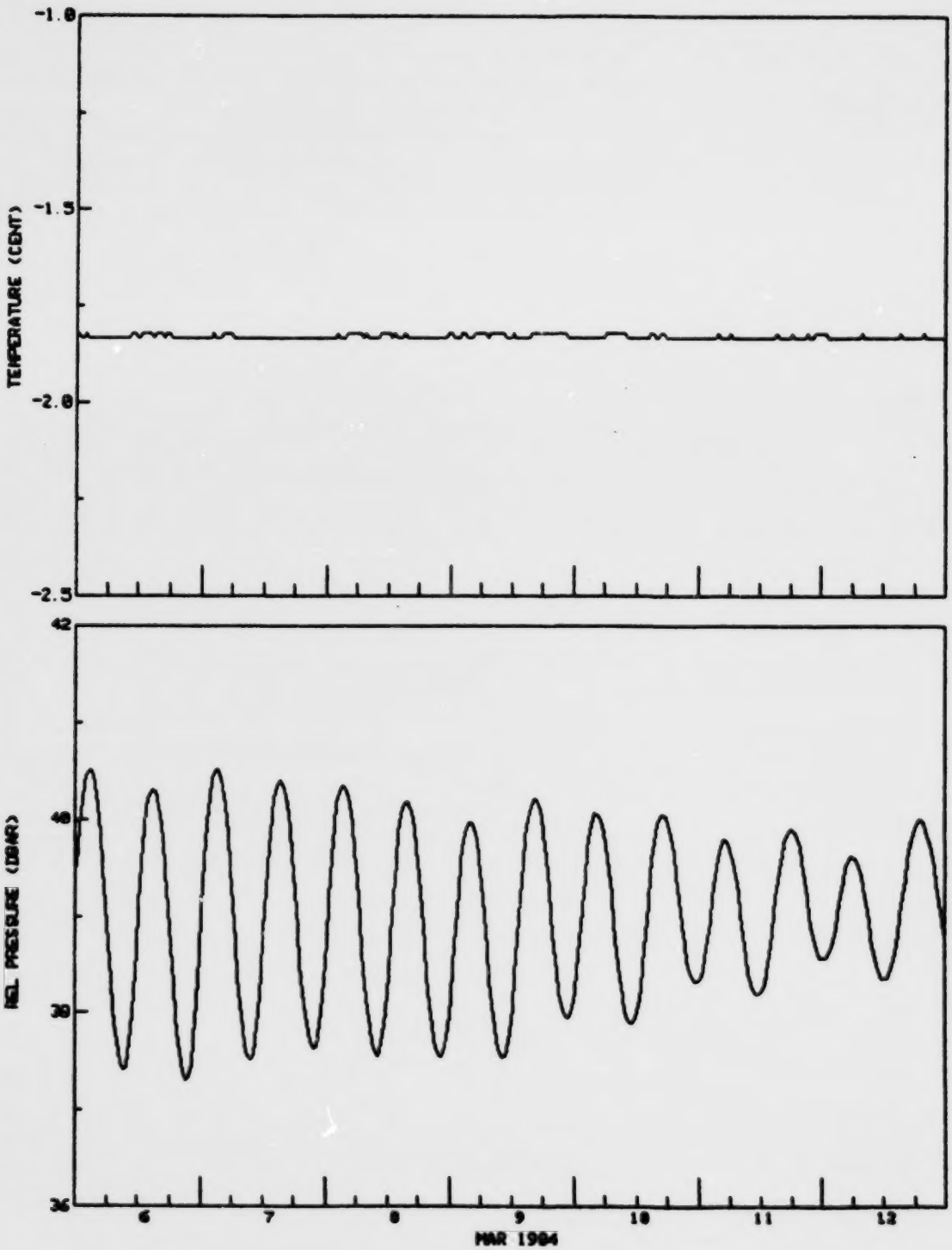
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA TG3A #199 69 51.6 'N 78 29.8'W



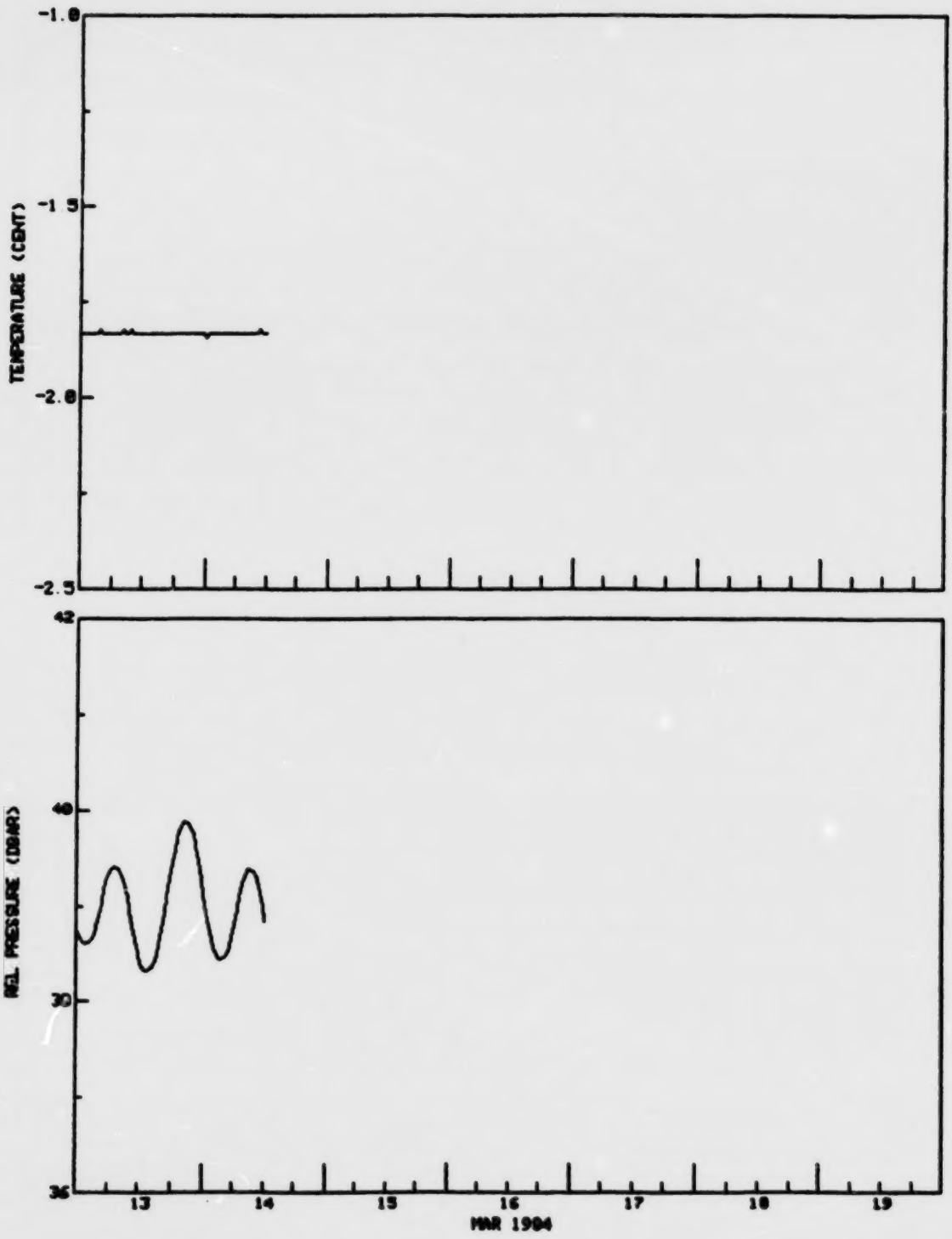
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA TG3A #199 69 51.6 'N 78 29.8'W



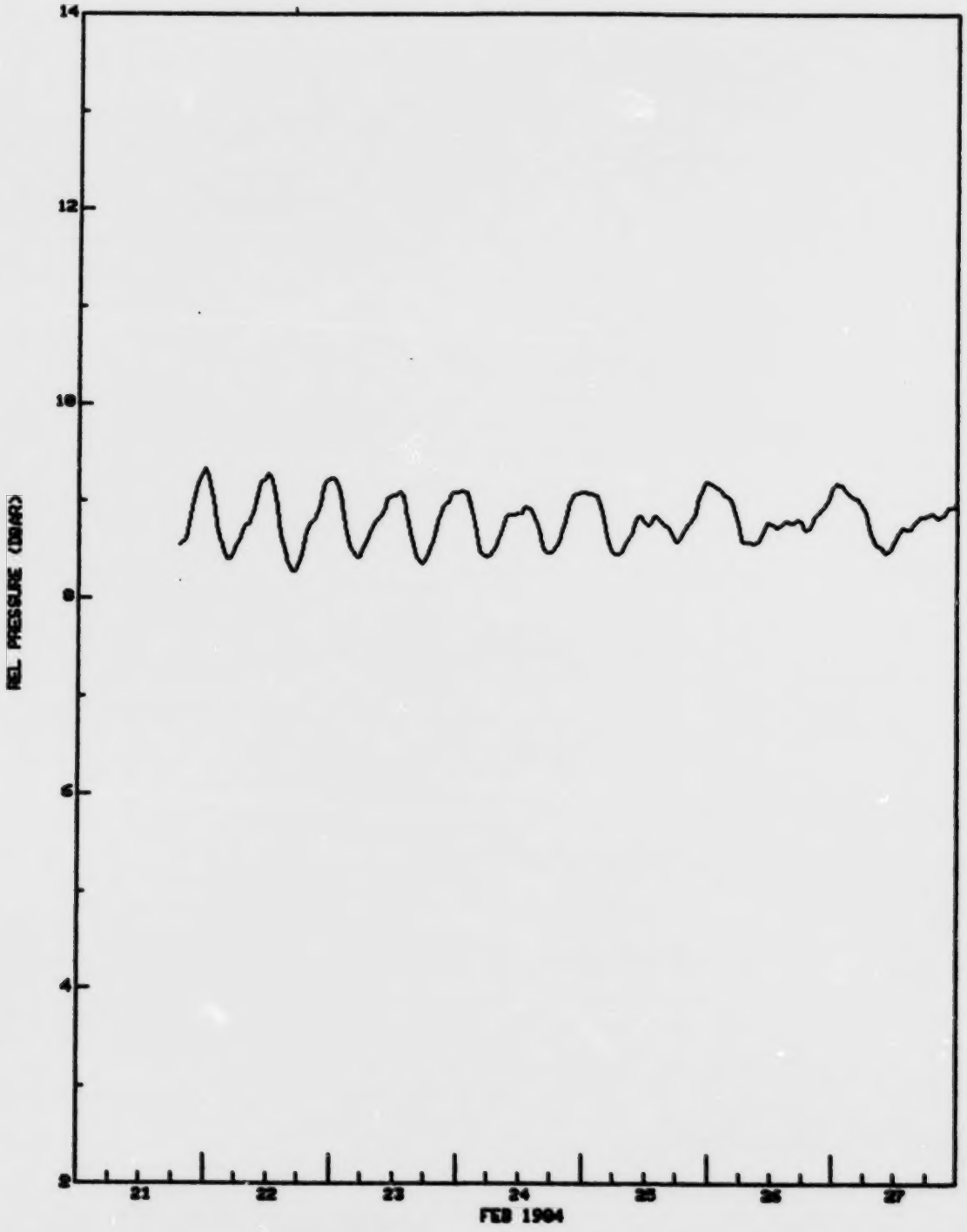
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA TG3A #199 69 51.6 'N 78 29.8'W



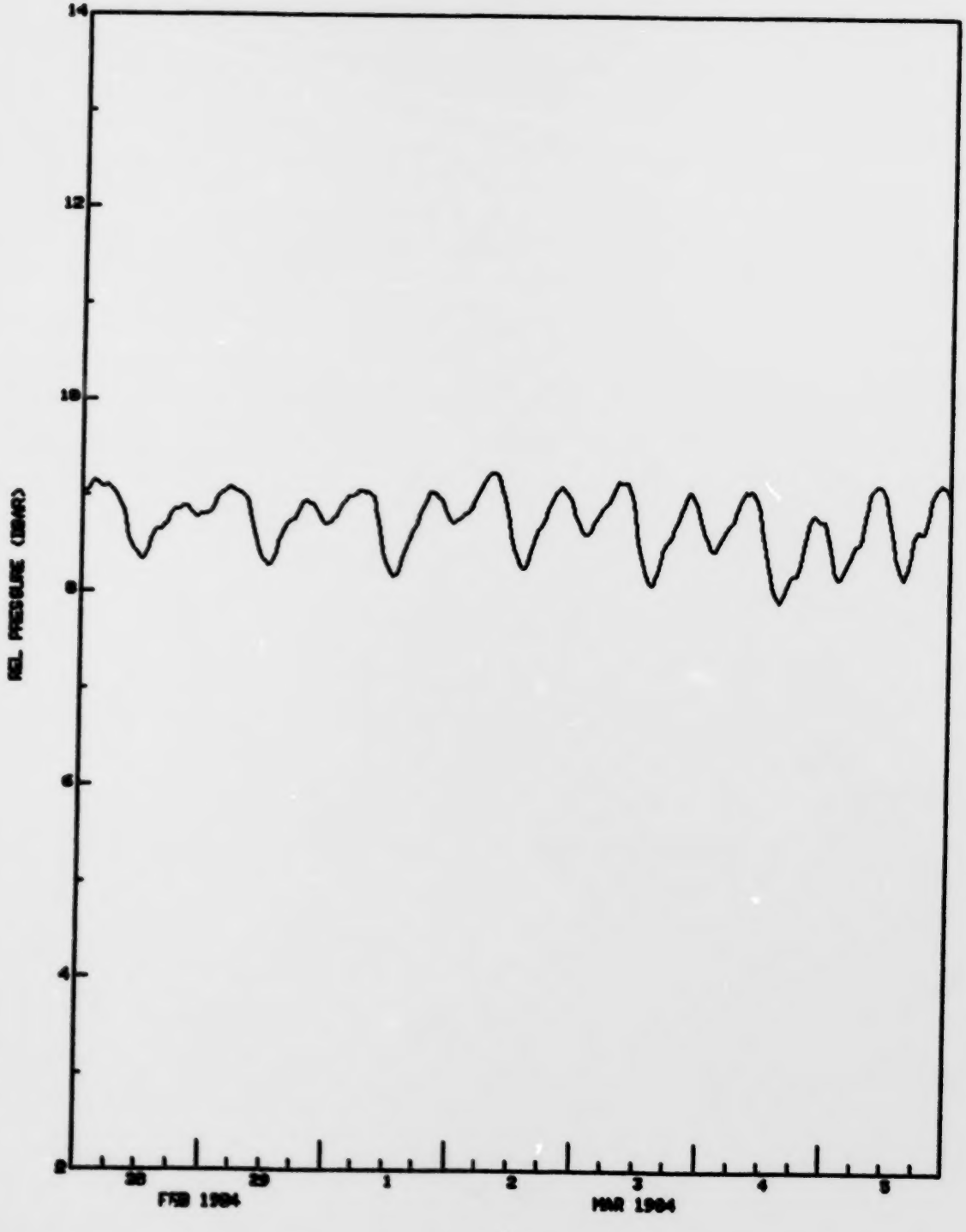
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



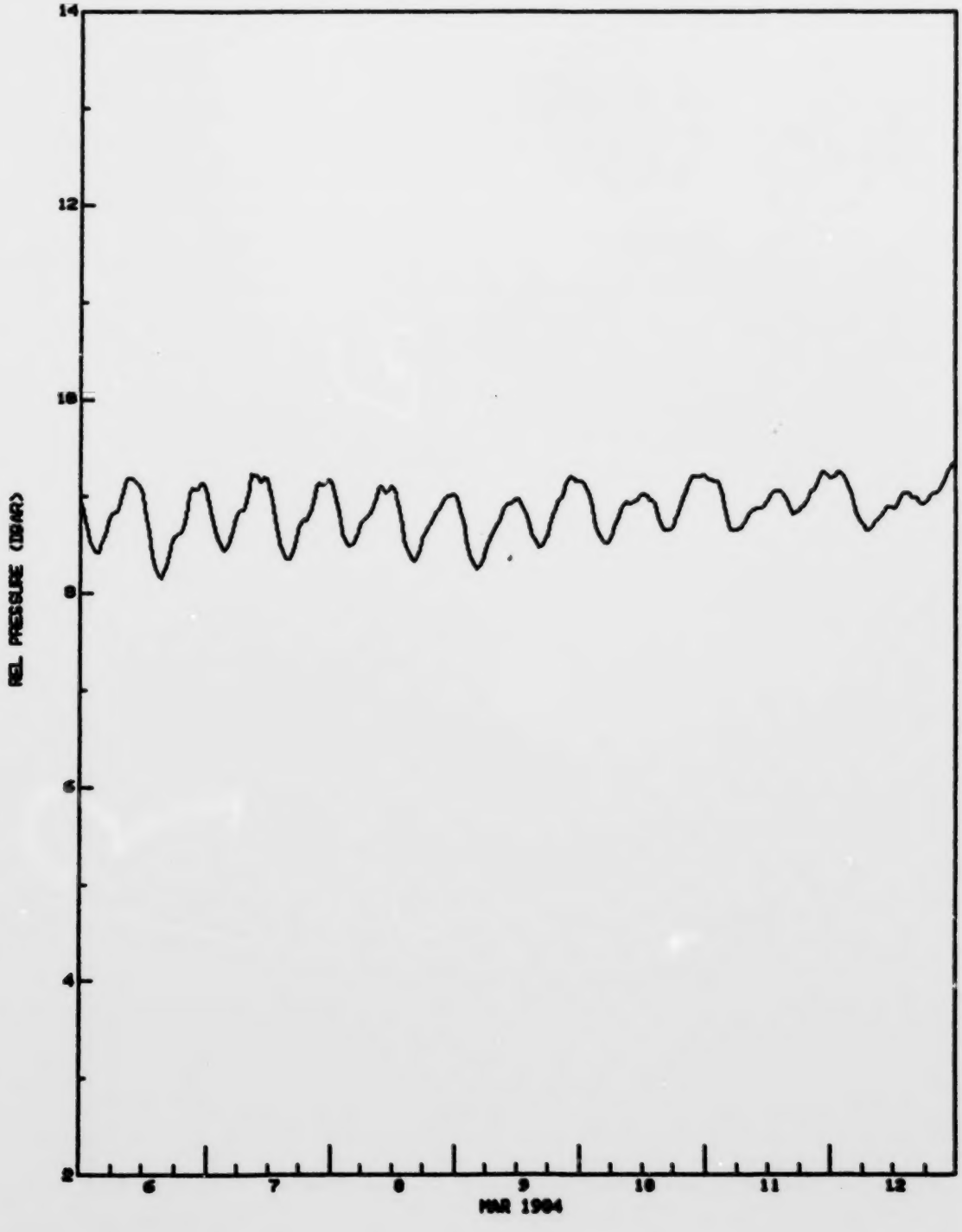
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



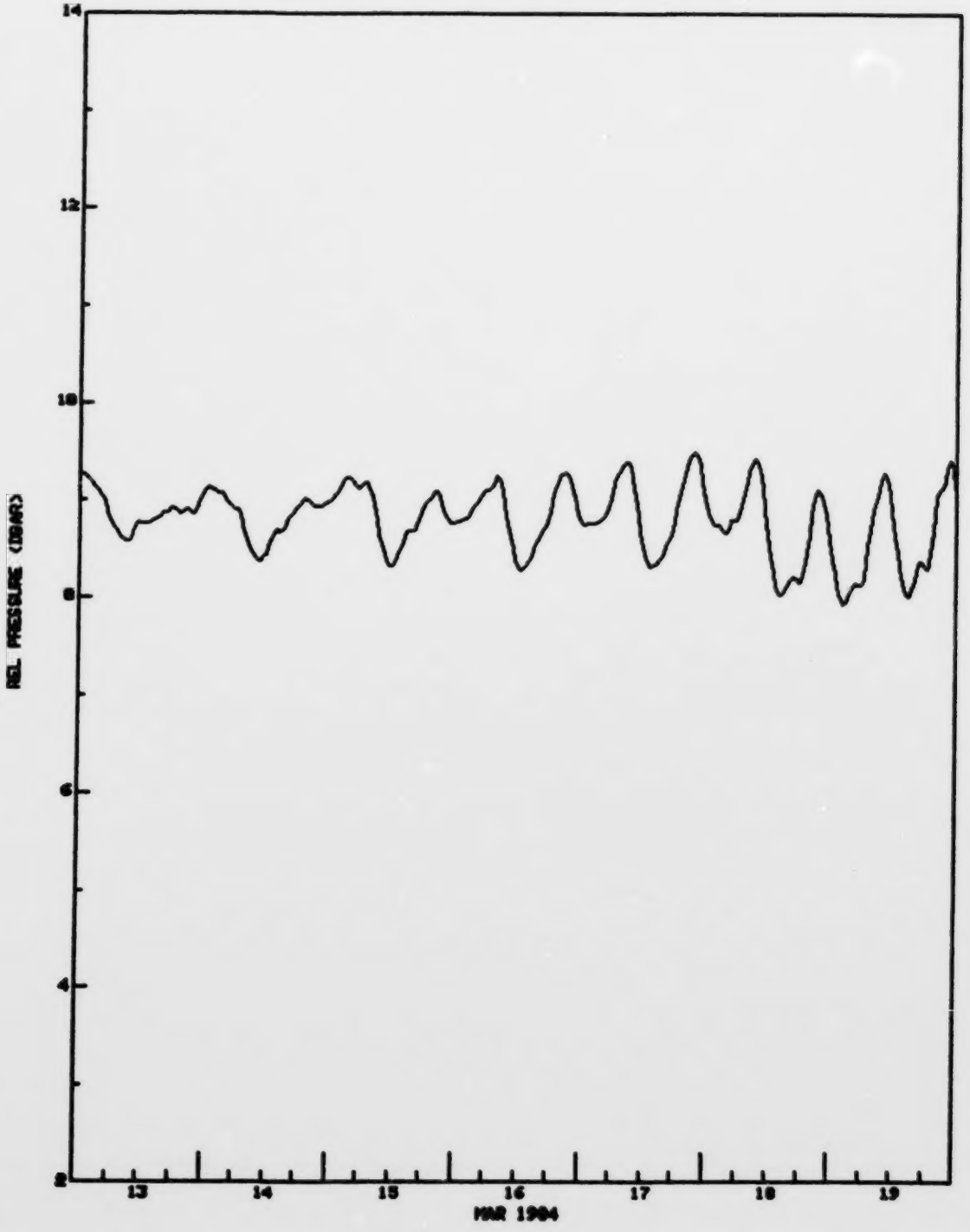
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



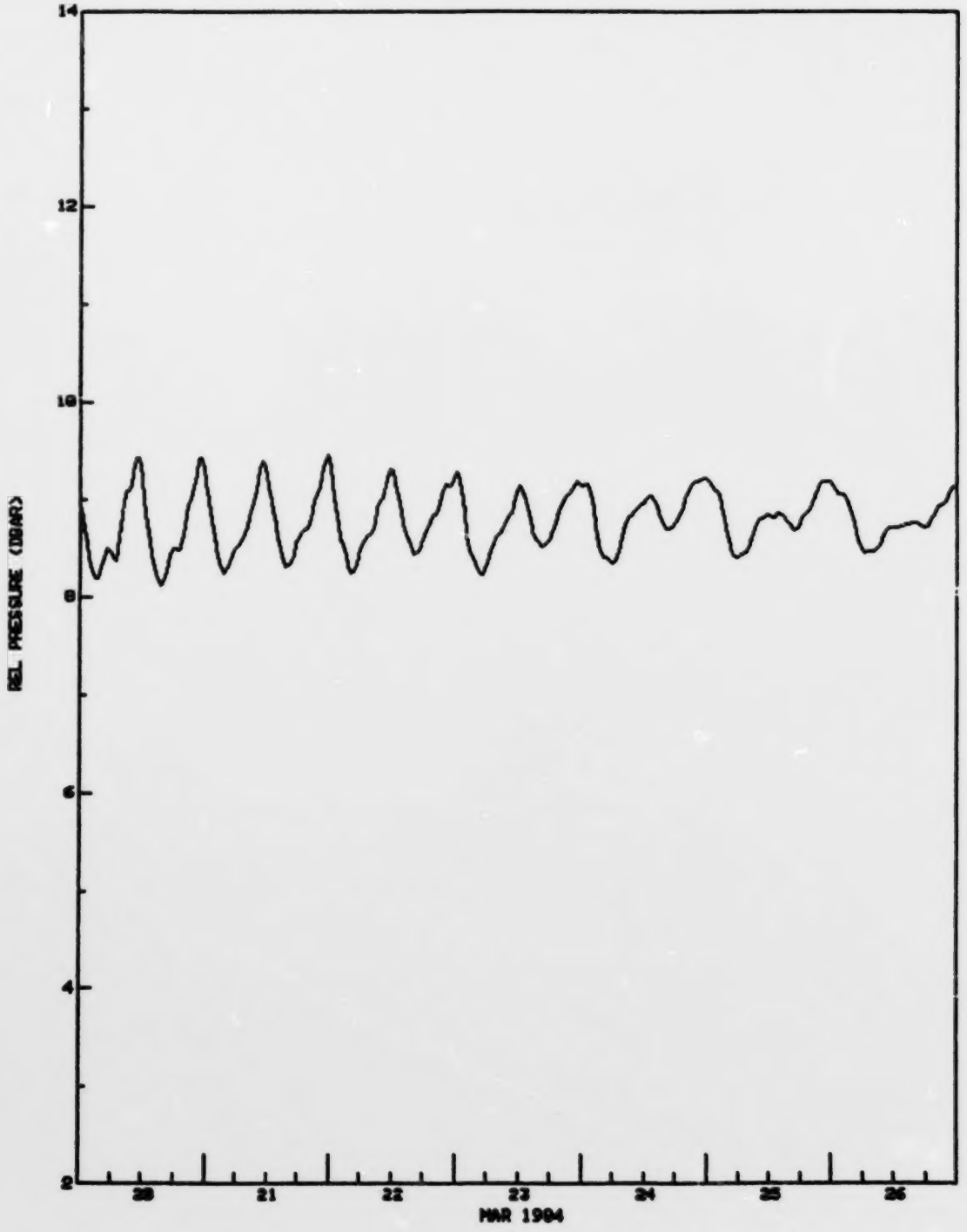
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



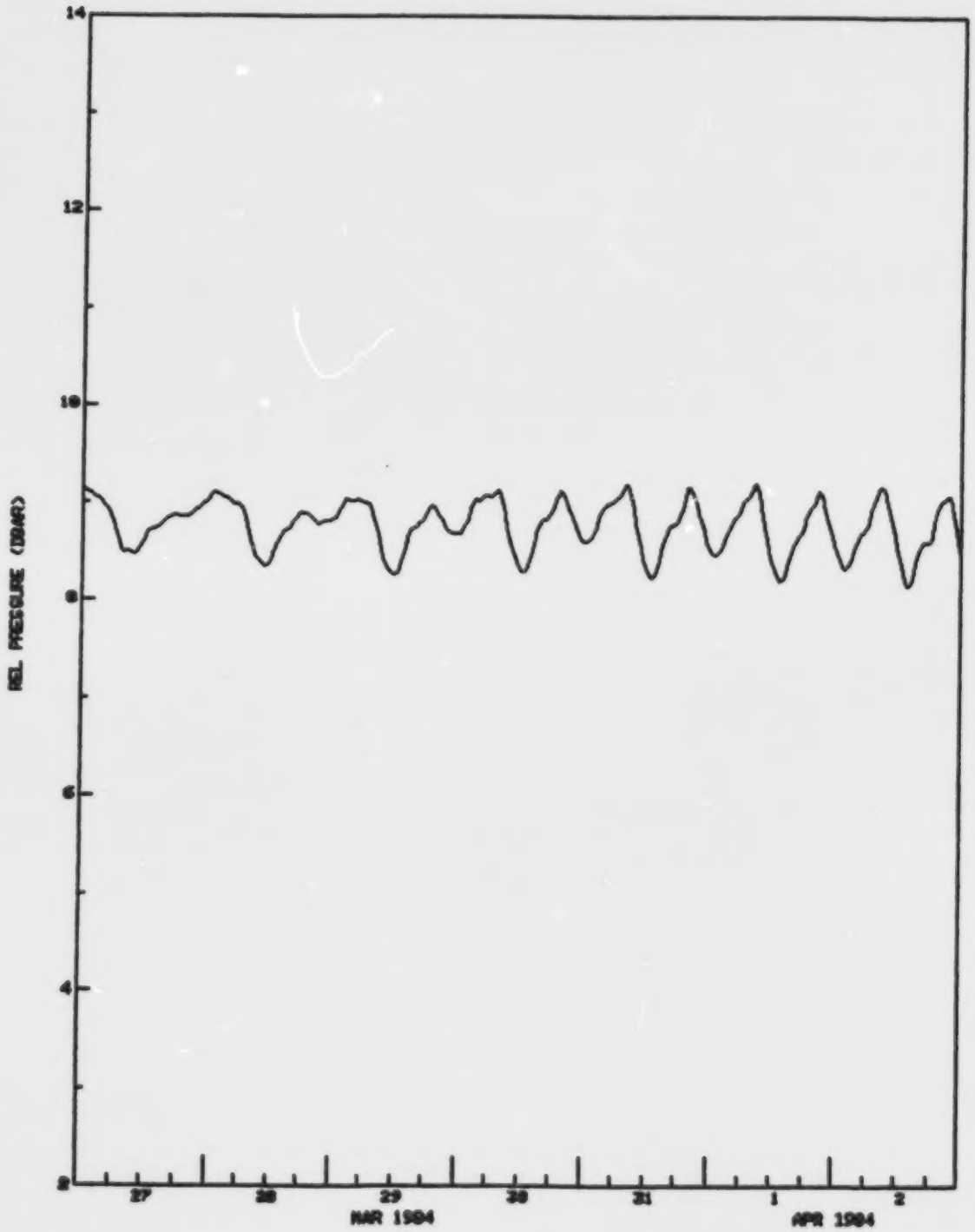
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



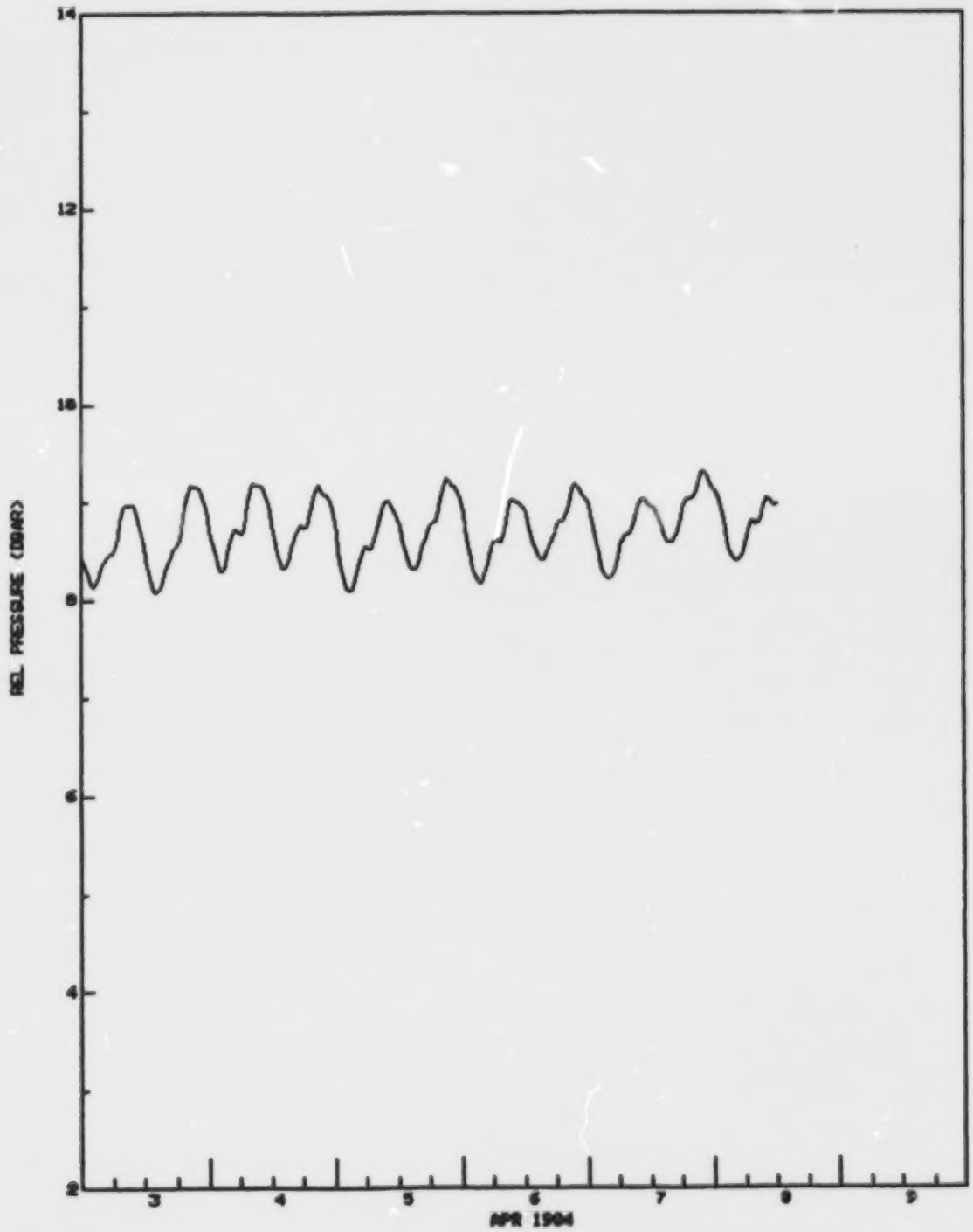
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



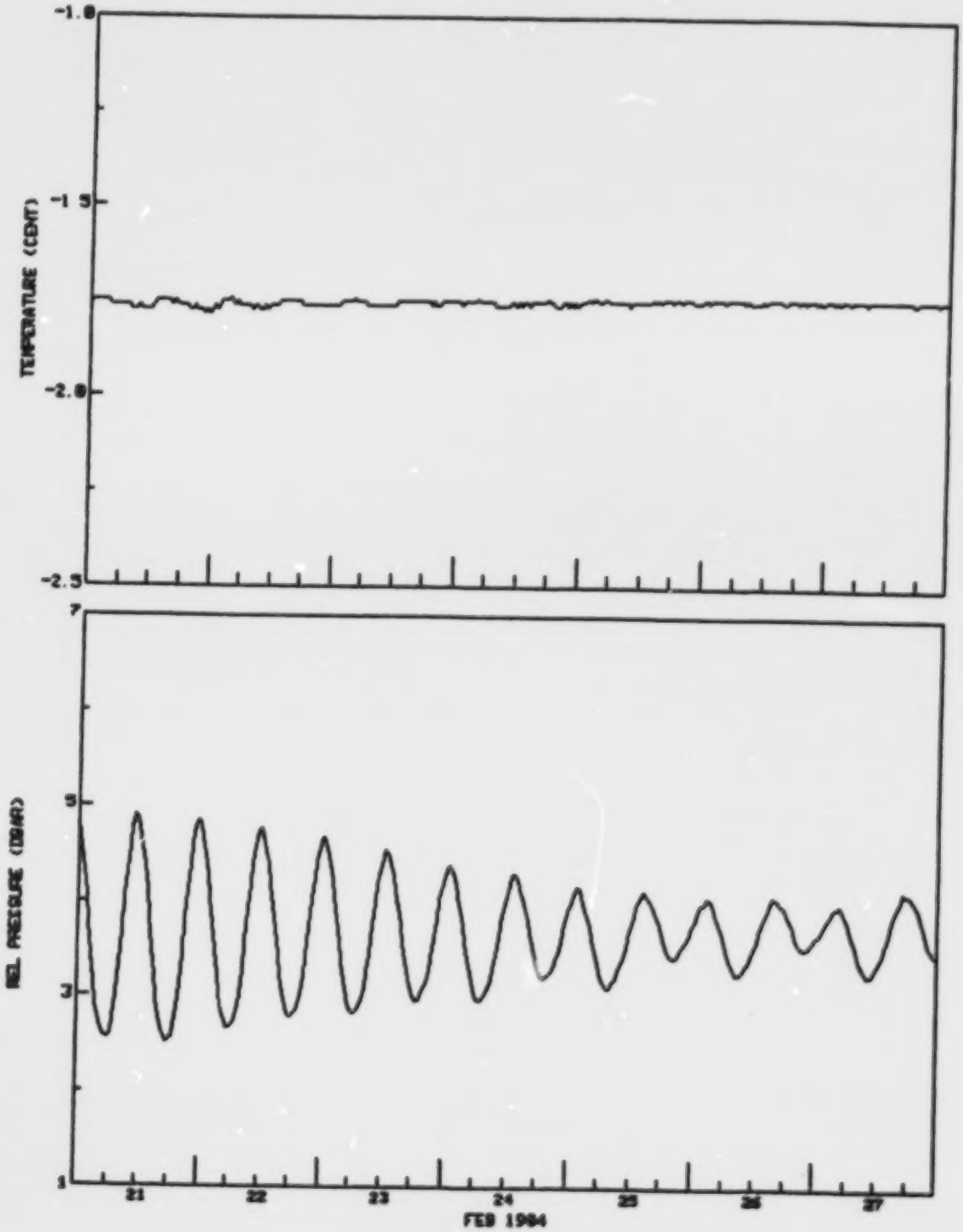
FOXE BASIN TIDAL SURVEY, 1984

SITE #2 AANDERAA WLR5 #388 68 23.5'N 82 8.9'W



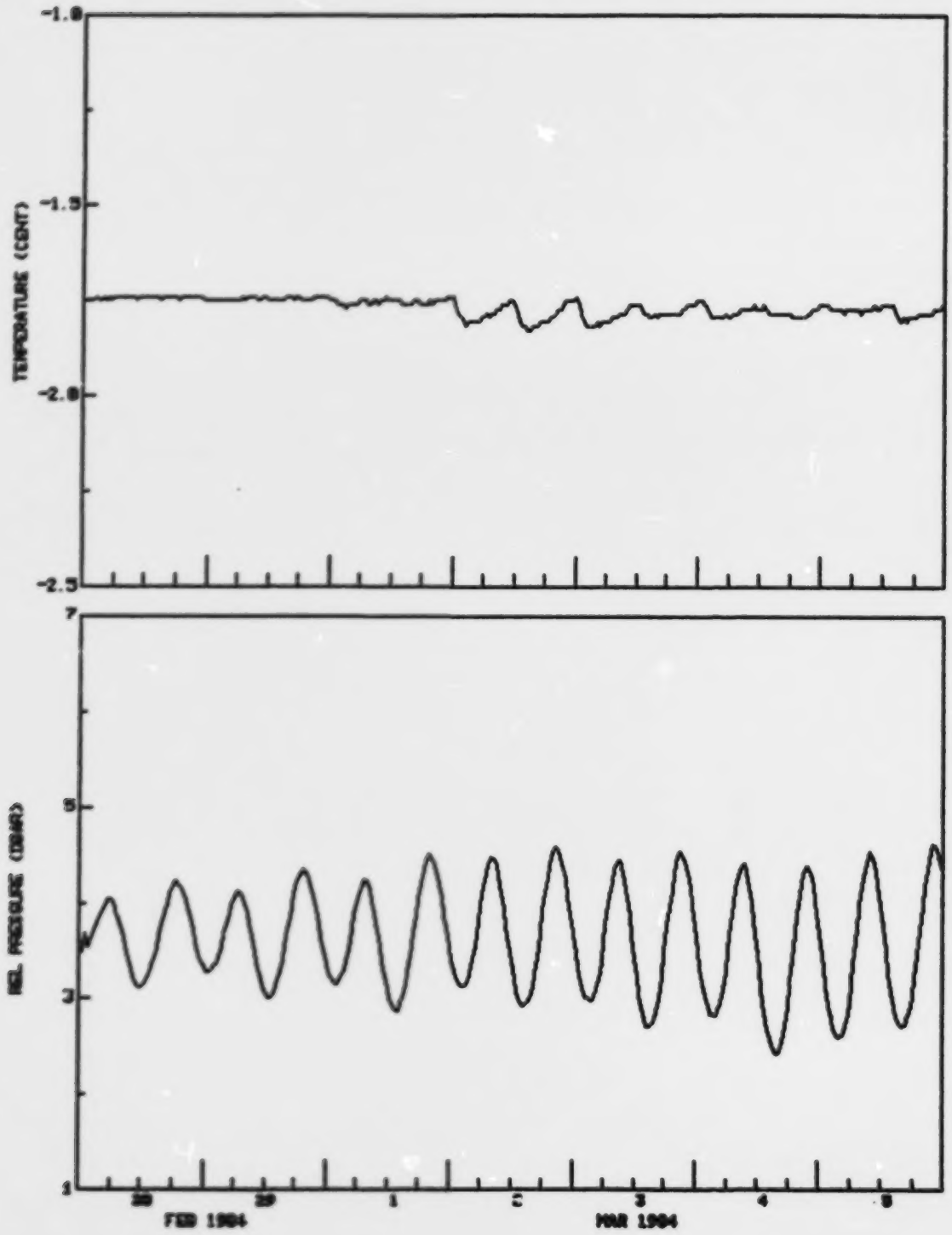
FOXE BASIN TIDAL SURVEY, 1984

SITE 03 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



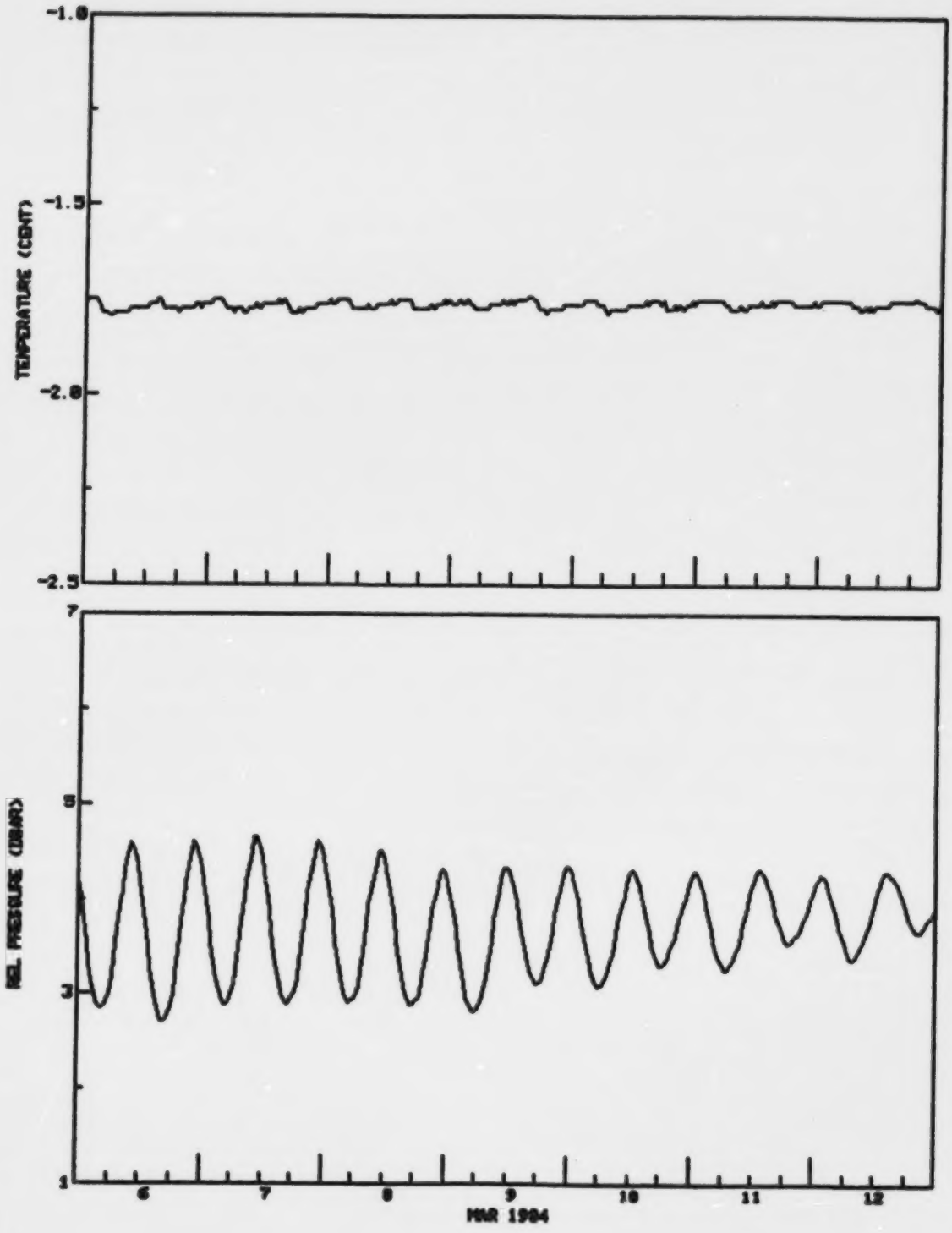
FOXE BASIN TIDAL SURVEY, 1984

SITE 63 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



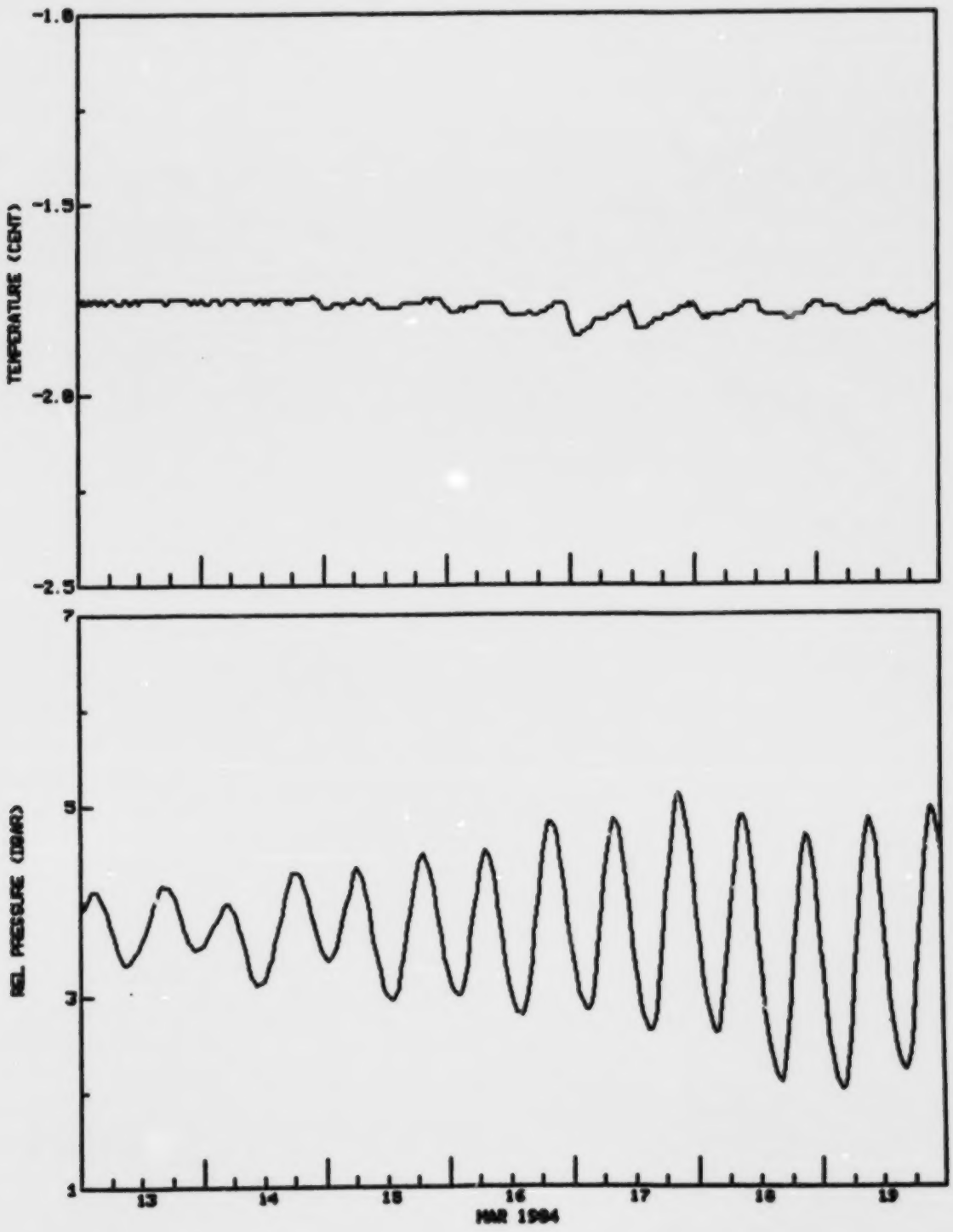
FOXE BASIN TIDAL SURVEY, 1984

SITE 63 AANDERAA TG3A 8224 68 12.1'N 79 5.2'W



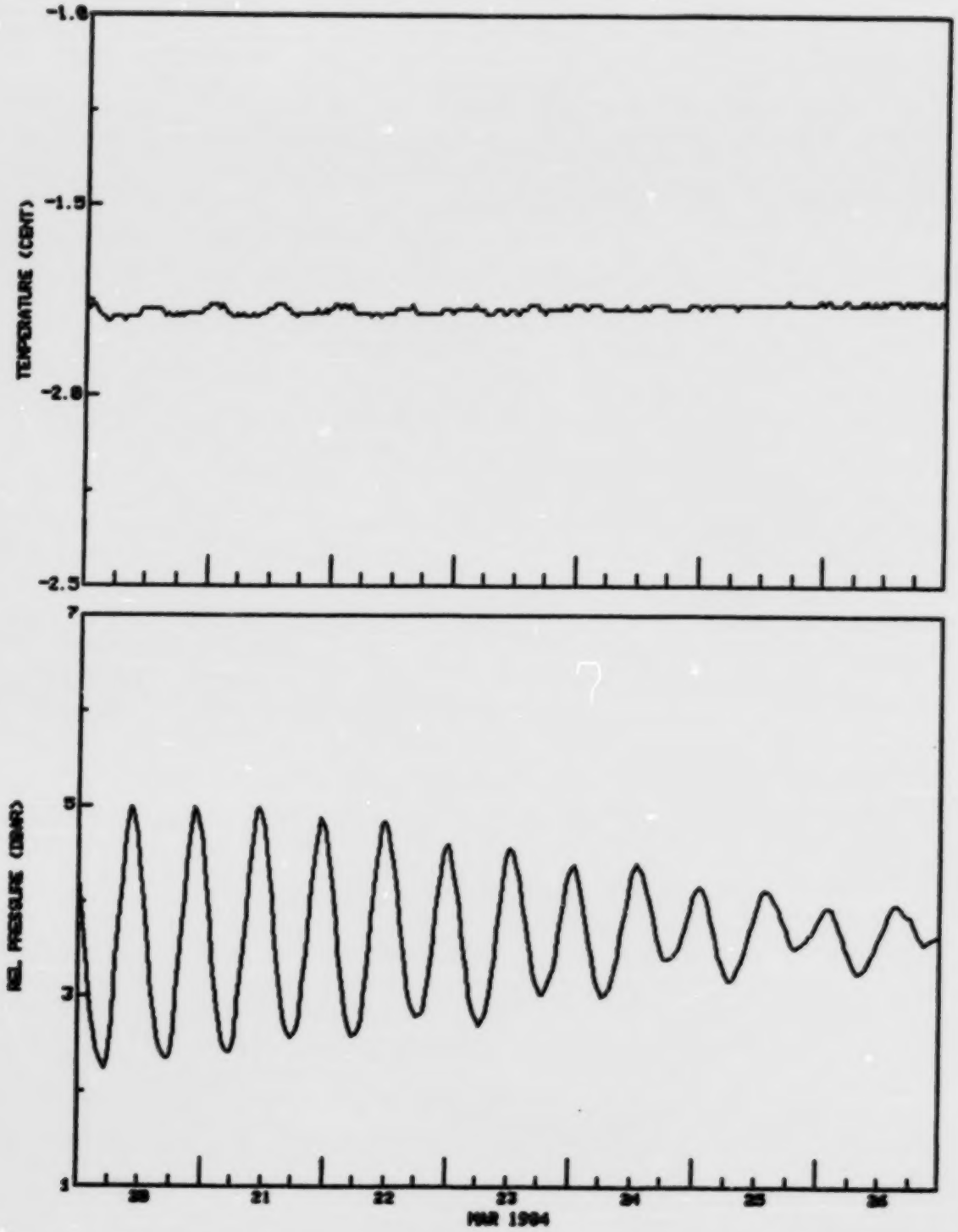
FOXE BASIN TIDAL SURVEY, 1984

SITE #3 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



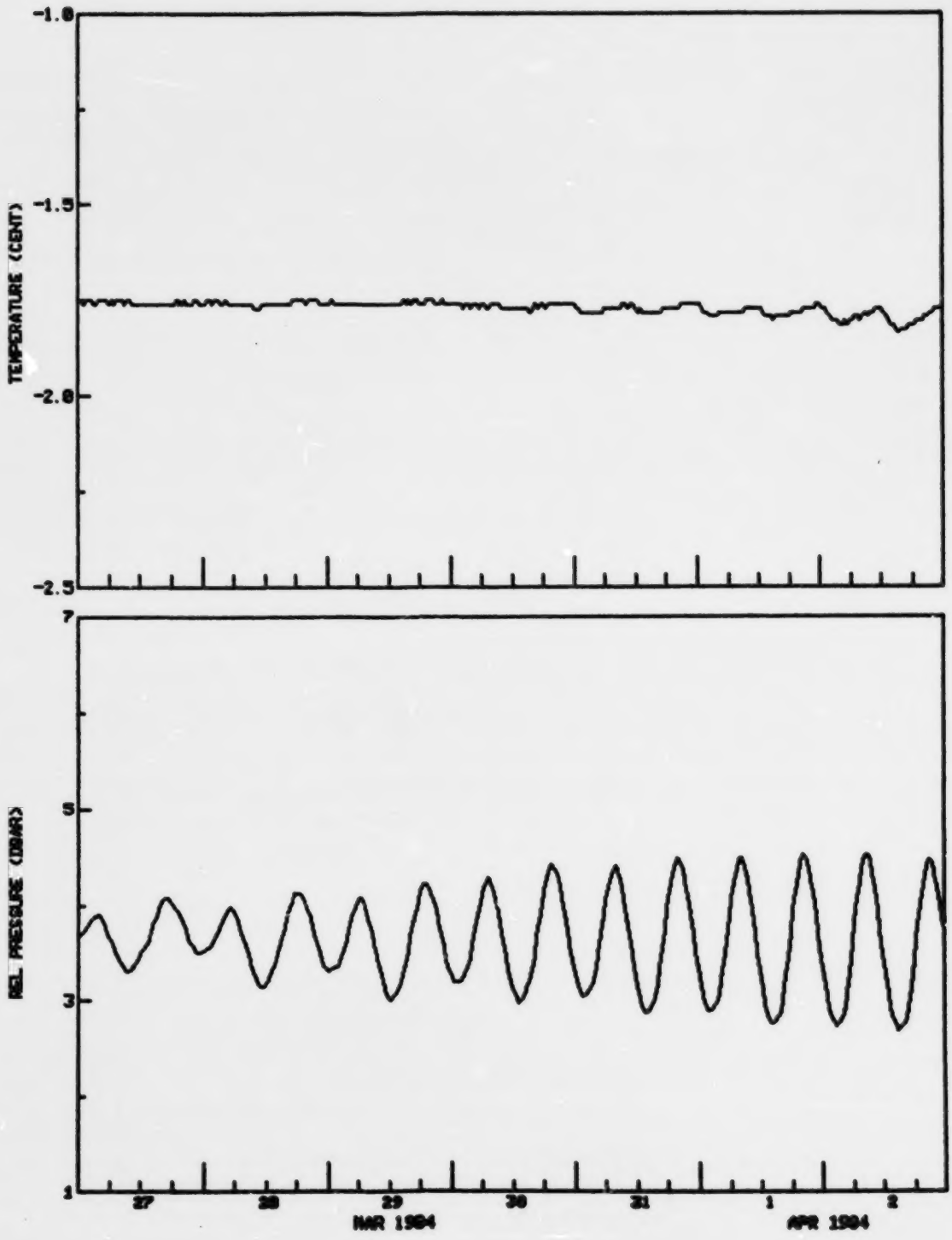
FOXE BASIN TIDAL SURVEY, 1984

SITE #3 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



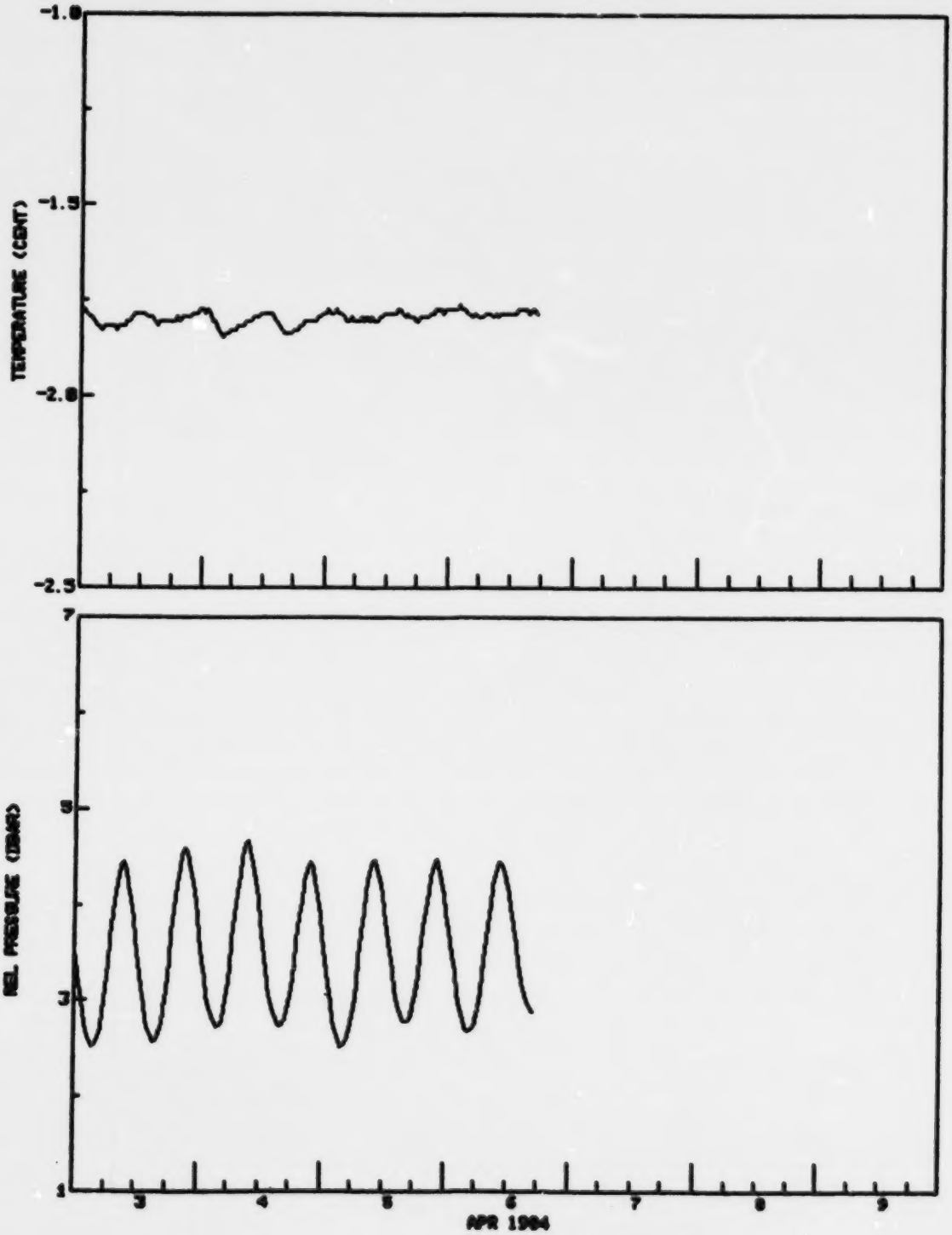
FOXE BASIN TIDAL SURVEY, 1984

SITE #3 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



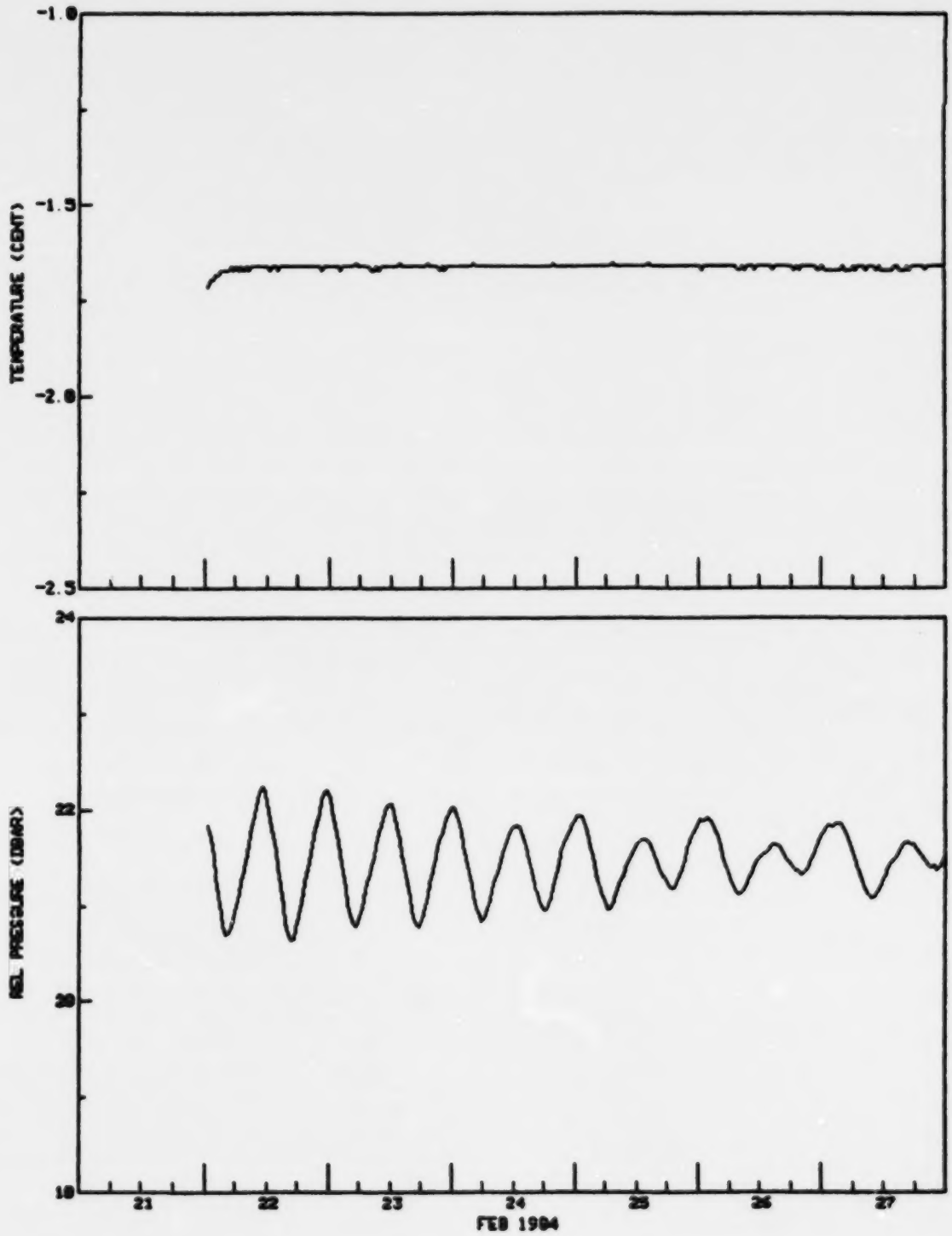
FOXE BASIN TIDAL SURVEY, 1984

SITE #3 AANDERAA TG3A #224 68 12.1'N 79 5.2'W



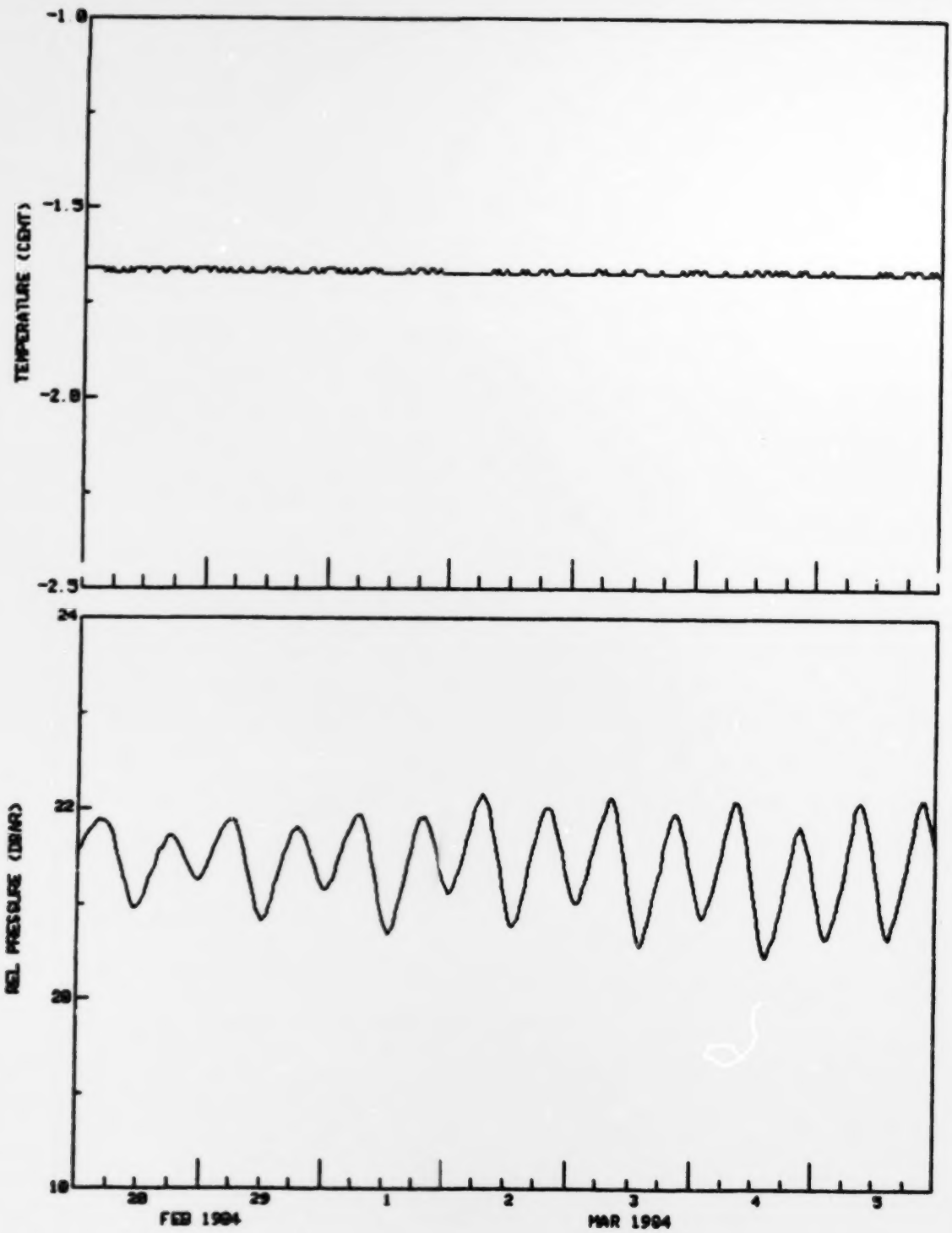
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TGJA #216 67 46.4'N 81 45.6'W



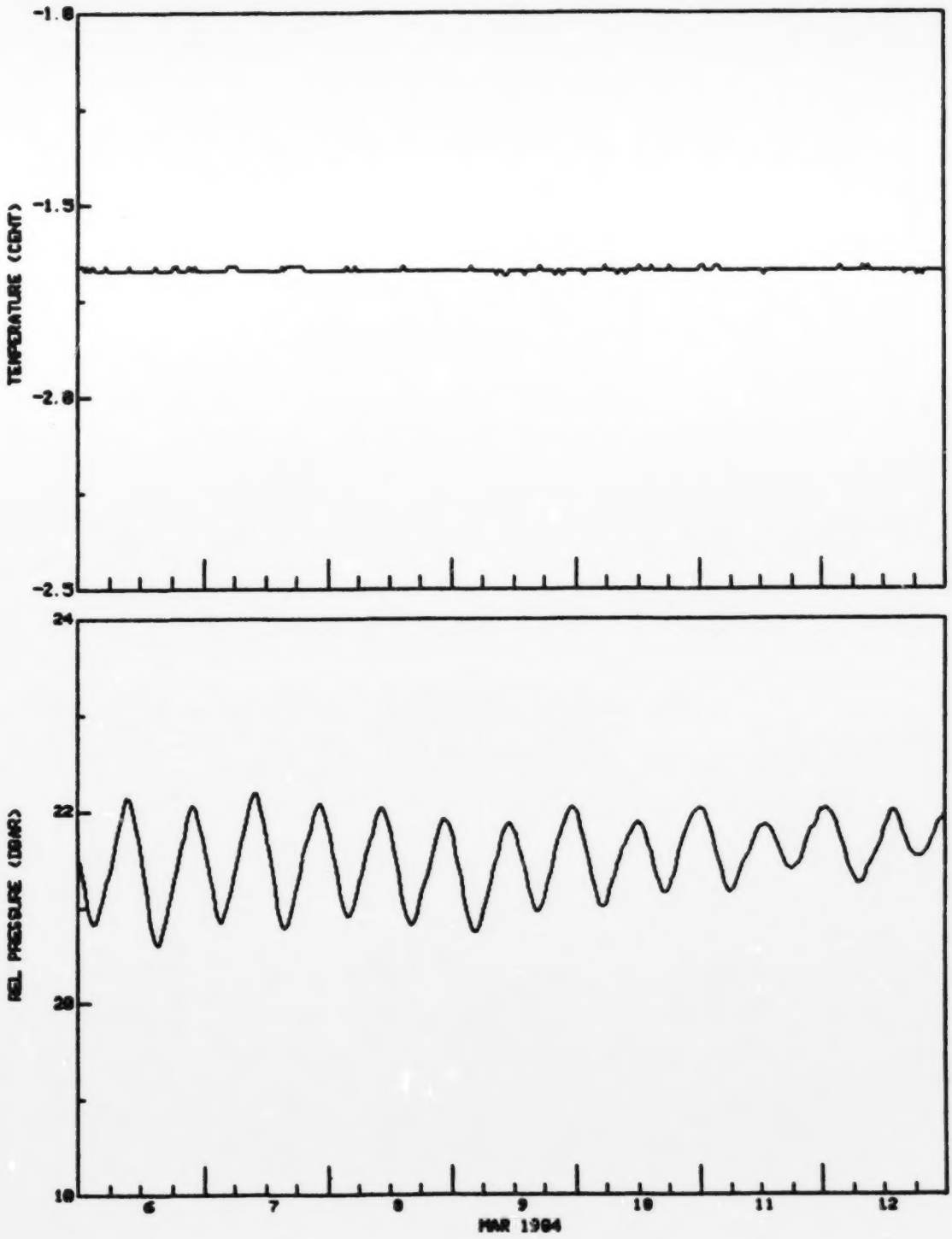
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TG3A #216 67 46.4'N 81 45 6'W



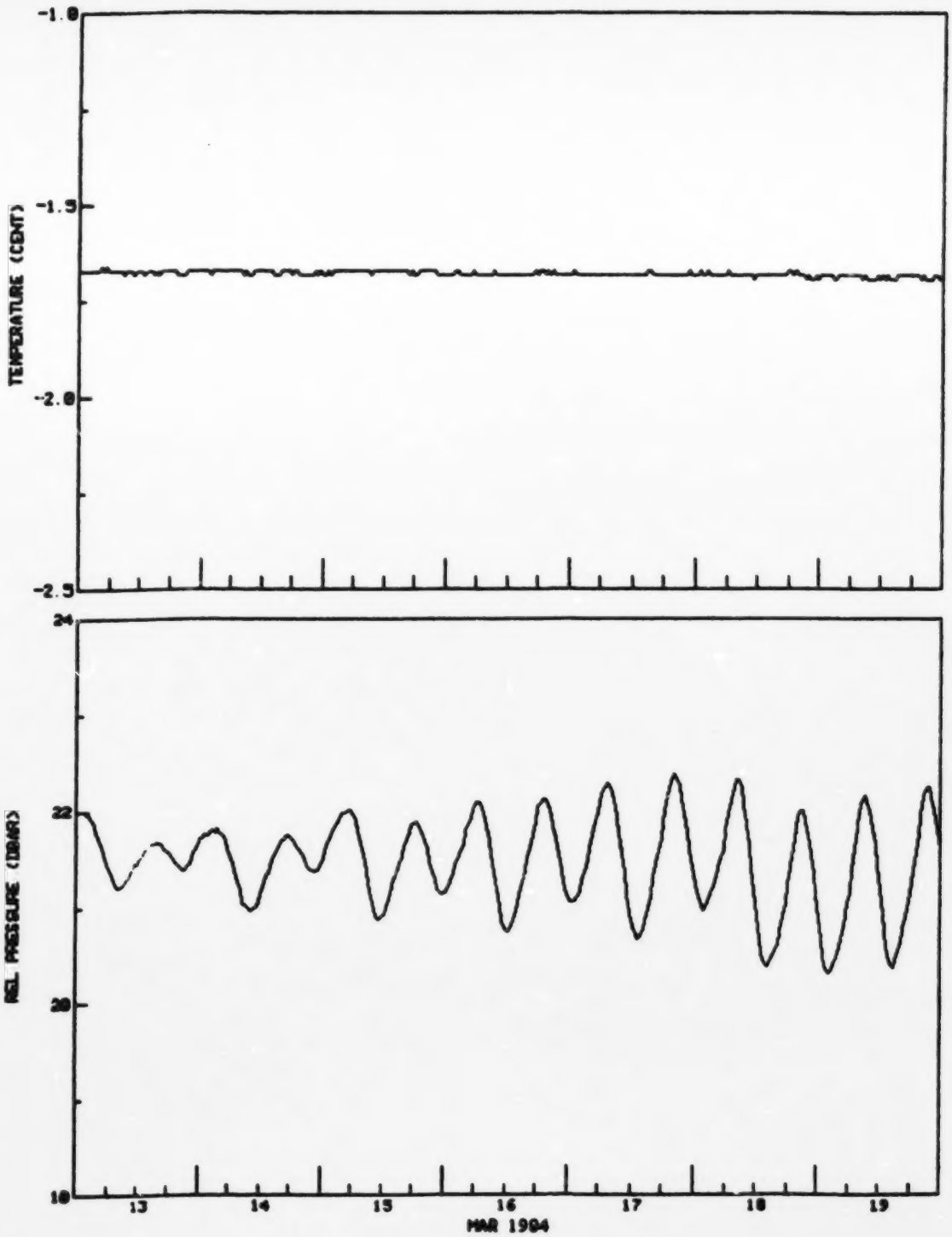
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TG3A #216 67 46.4'N 81 45 6'W



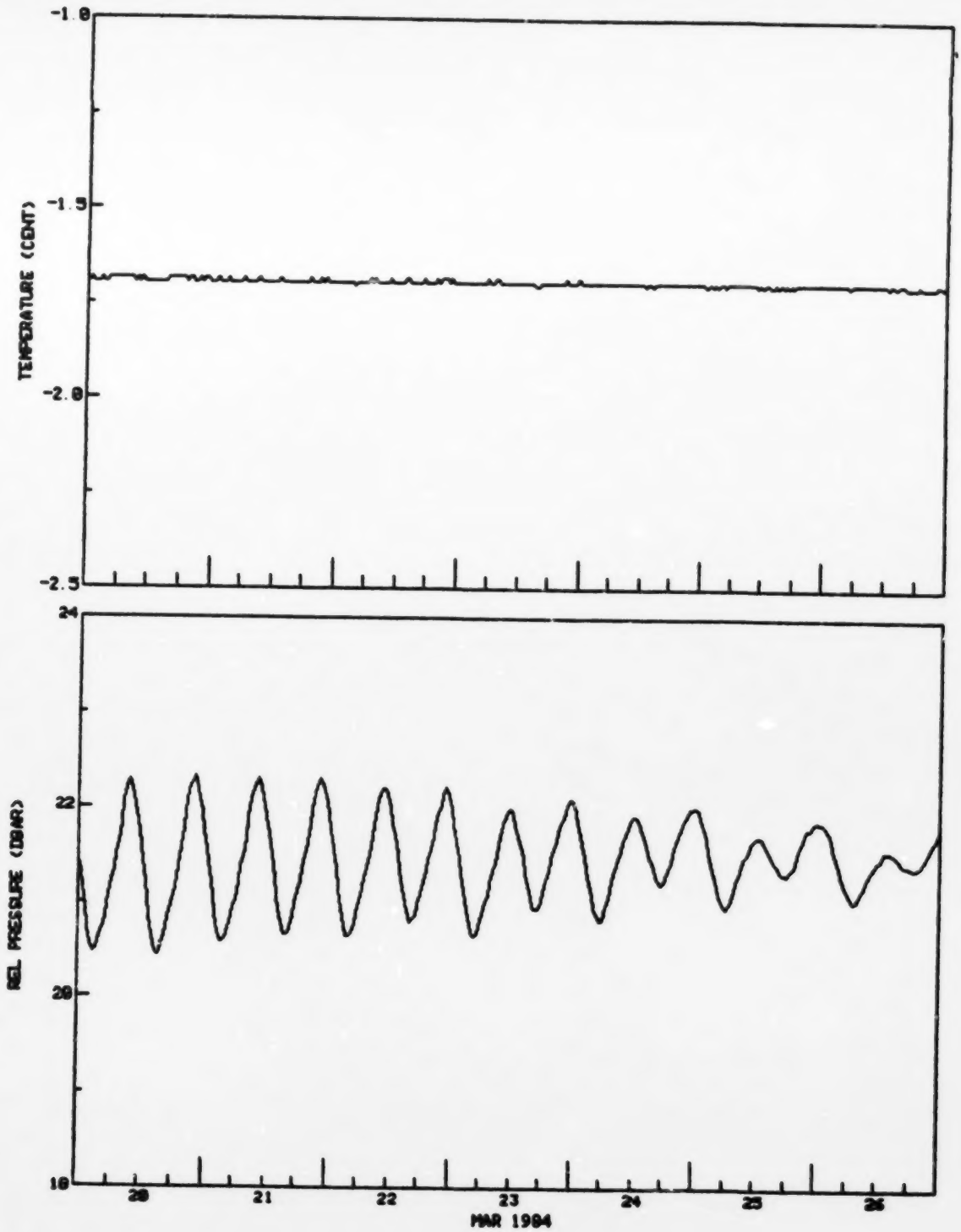
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TGJA #216 67 46.4'N 81 45.6'W



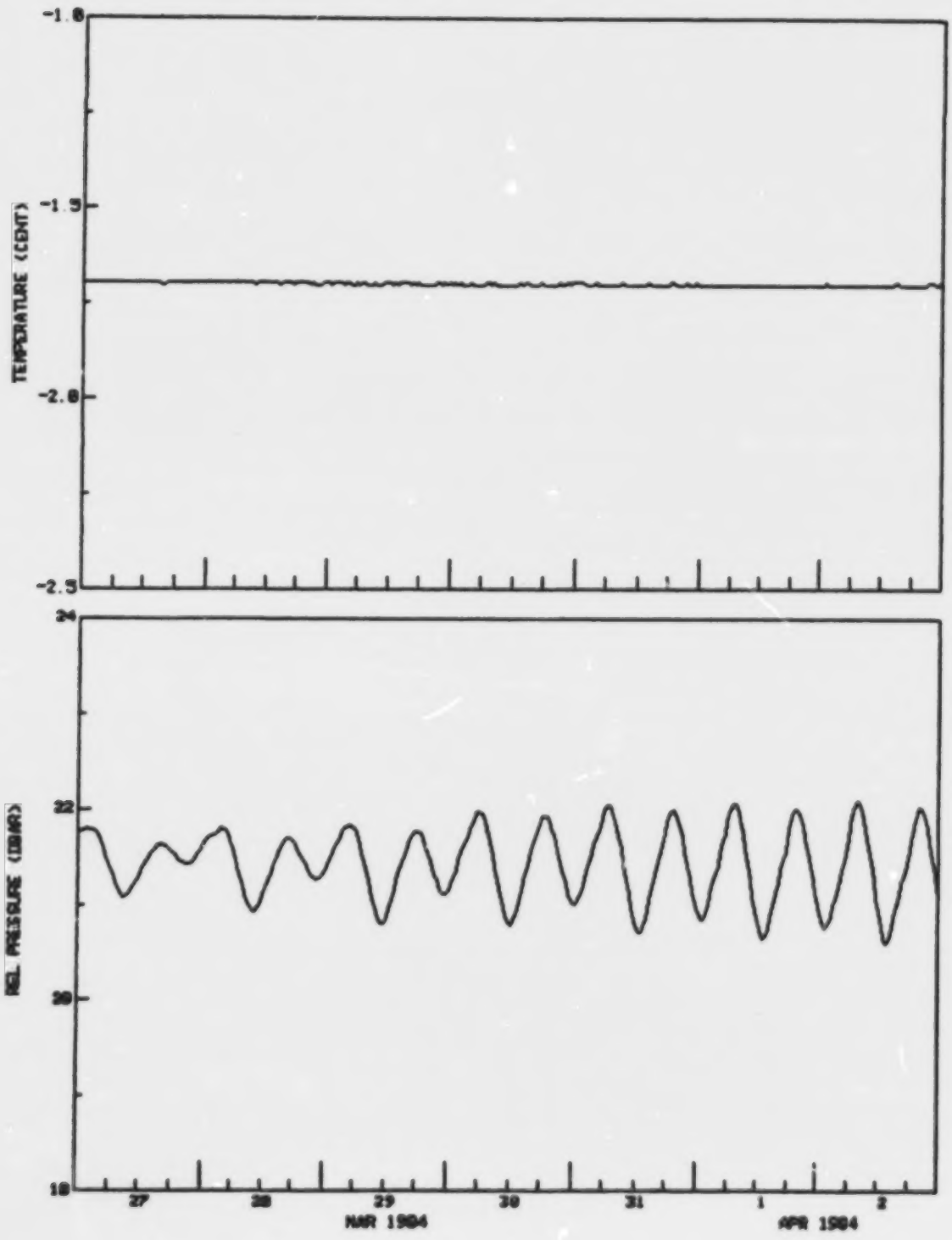
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TG3A #216 67 46.4'N 81 45.6'W



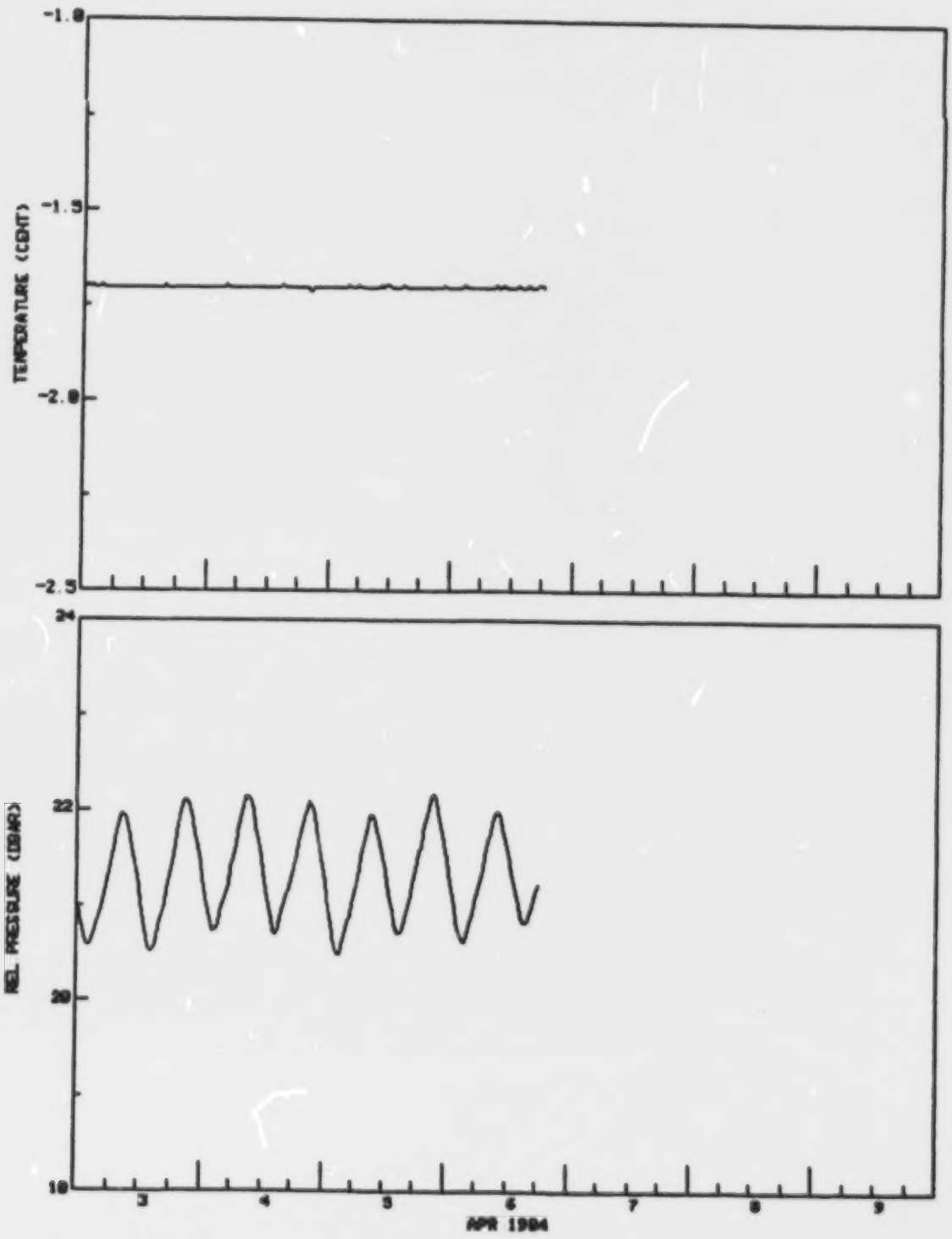
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TG3A #216 67 46.4'N 81 45.6'W



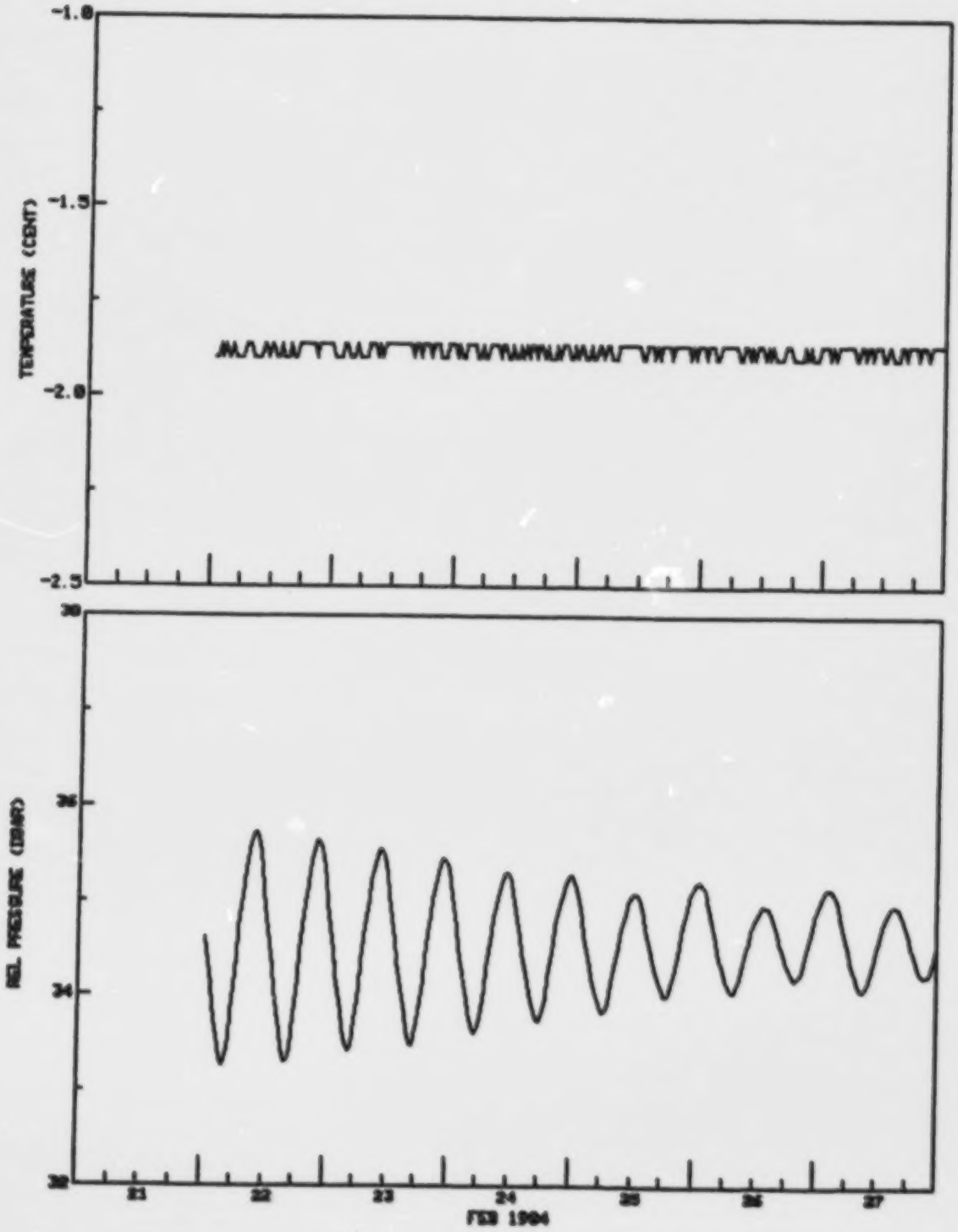
FOXE BASIN TIDAL SURVEY, 1984

SITE #5 AANDERAA TGJA #216 67 46.4'N 81 45.6'W



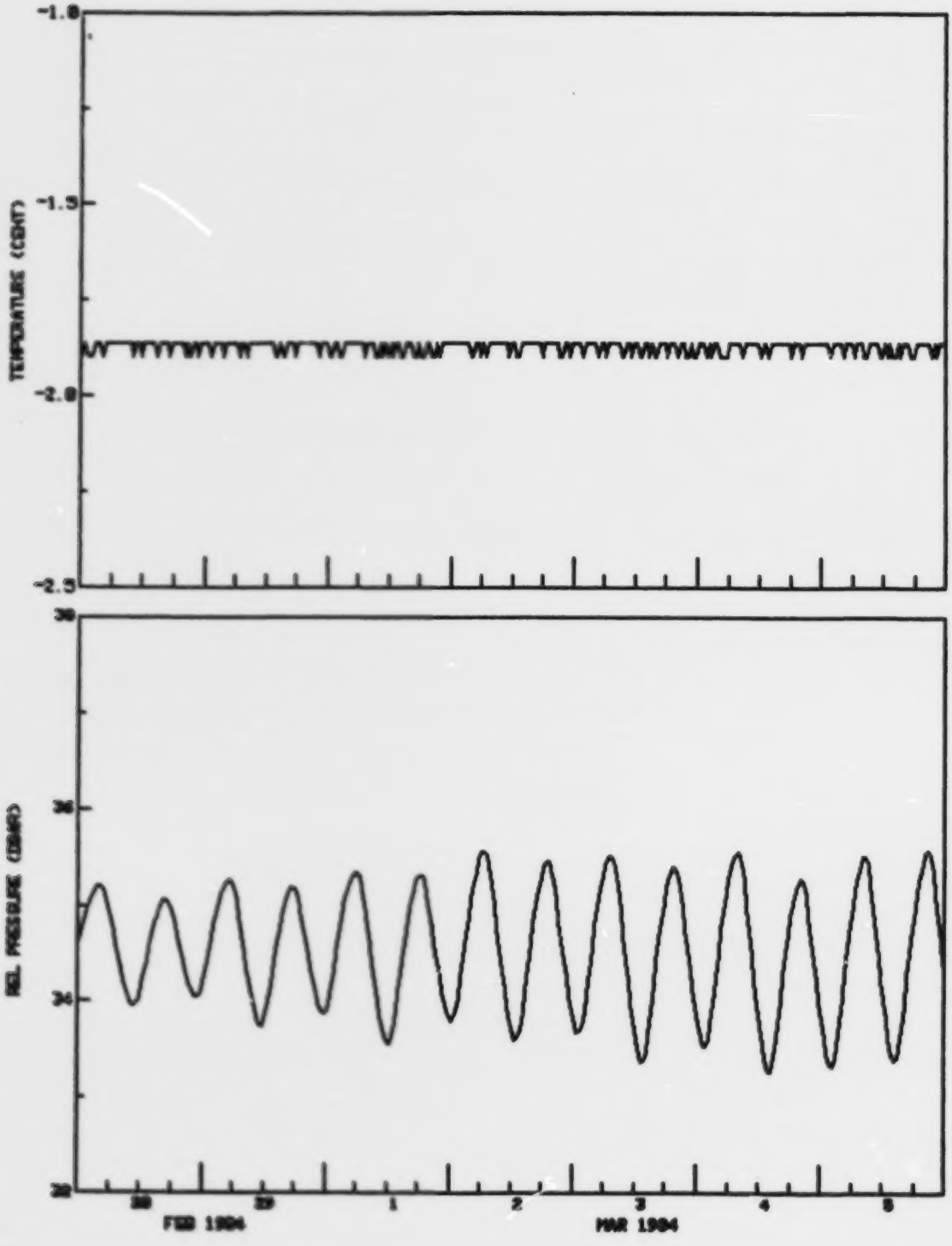
FOXE BASIN TIDAL SURVEY, 1984

SITE 08 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



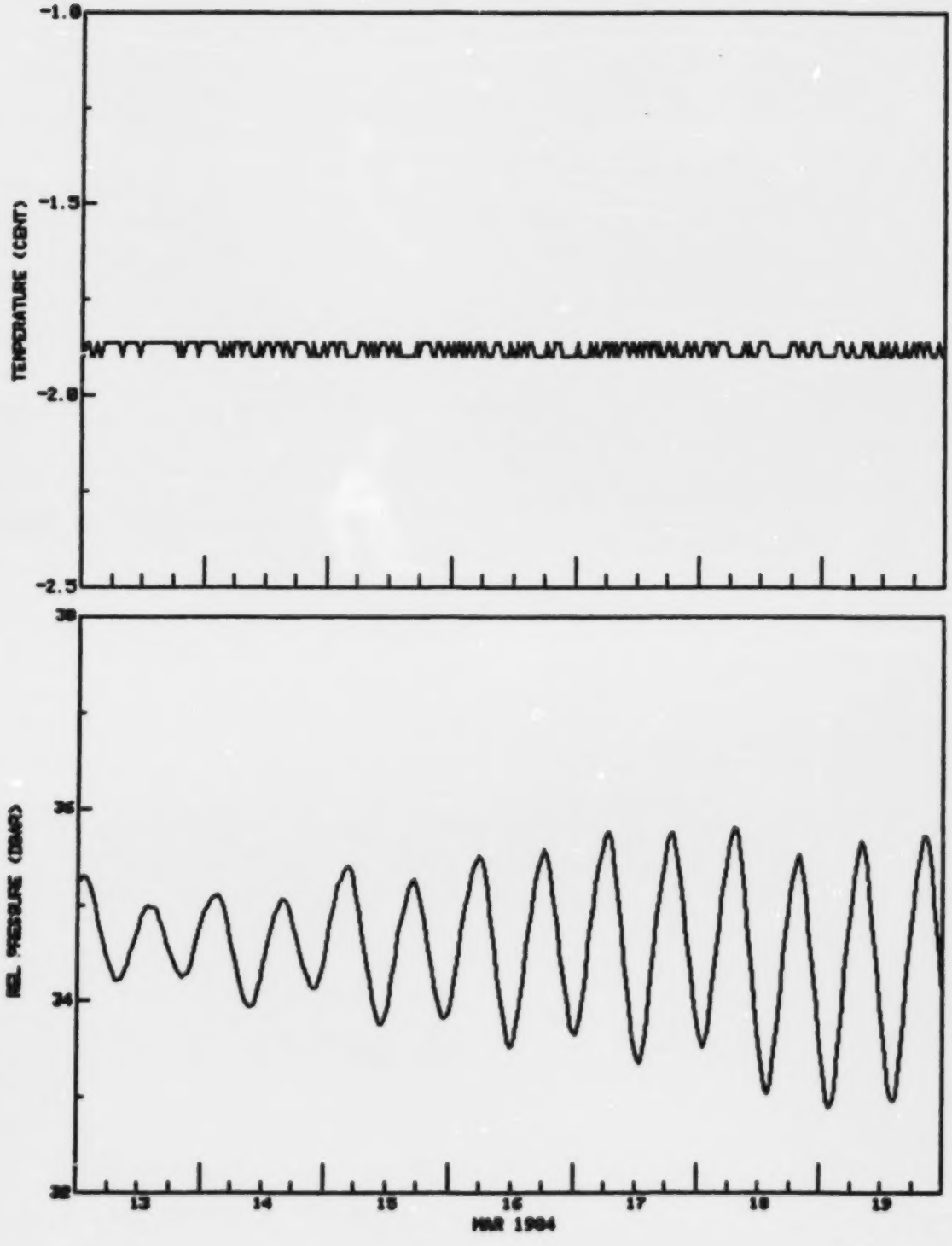
FOXE BASIN TIDAL SURVEY, 1984

SITE 08 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



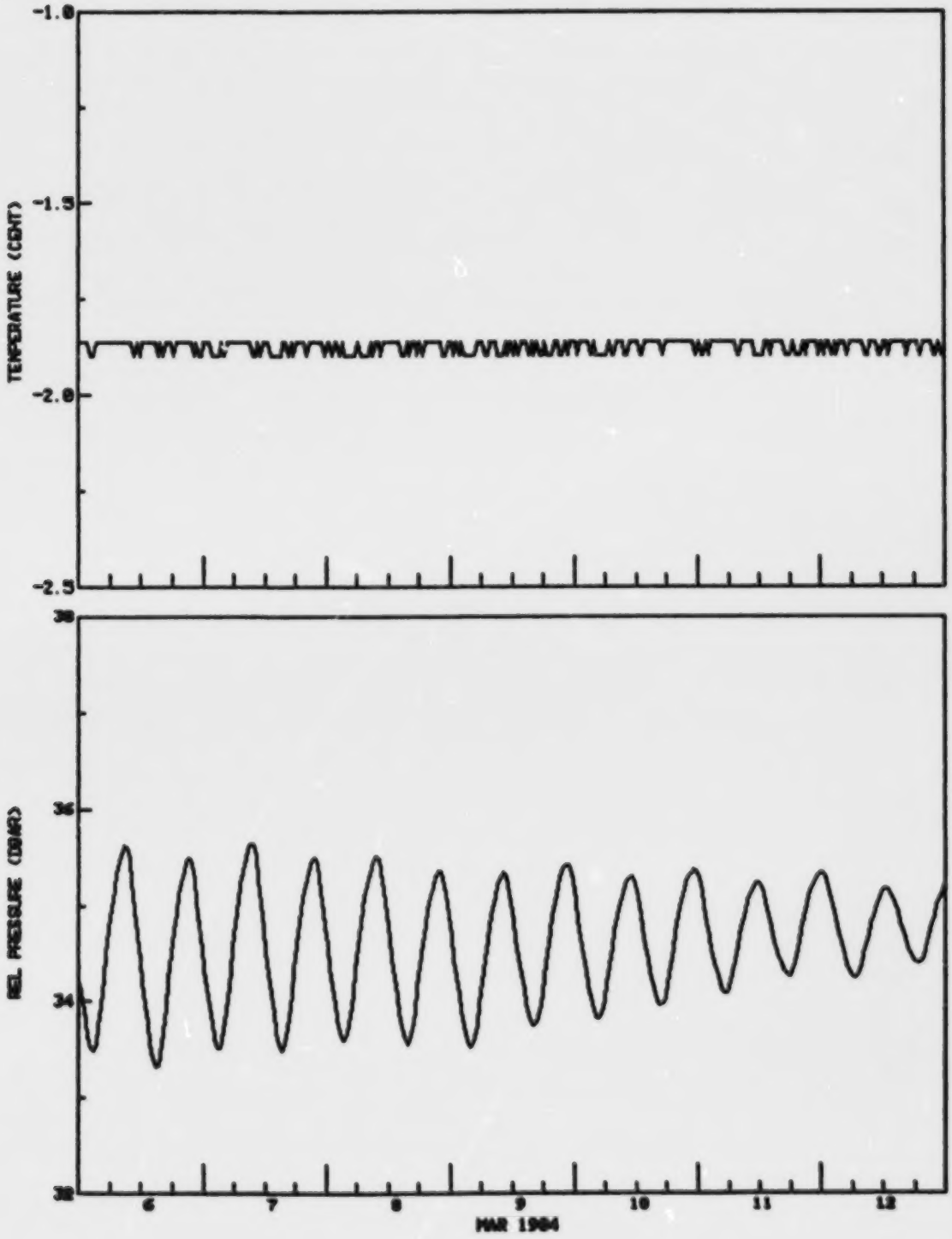
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



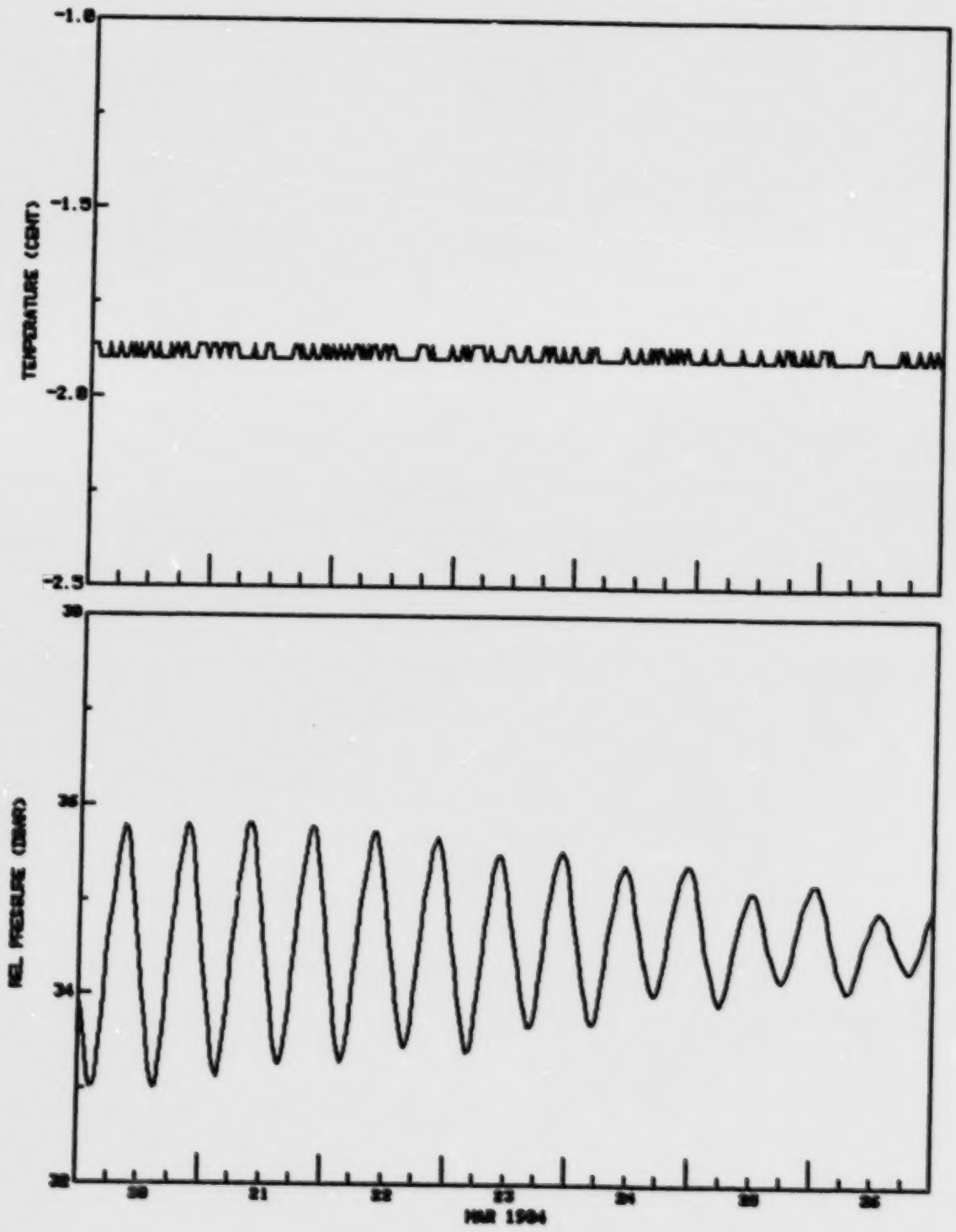
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



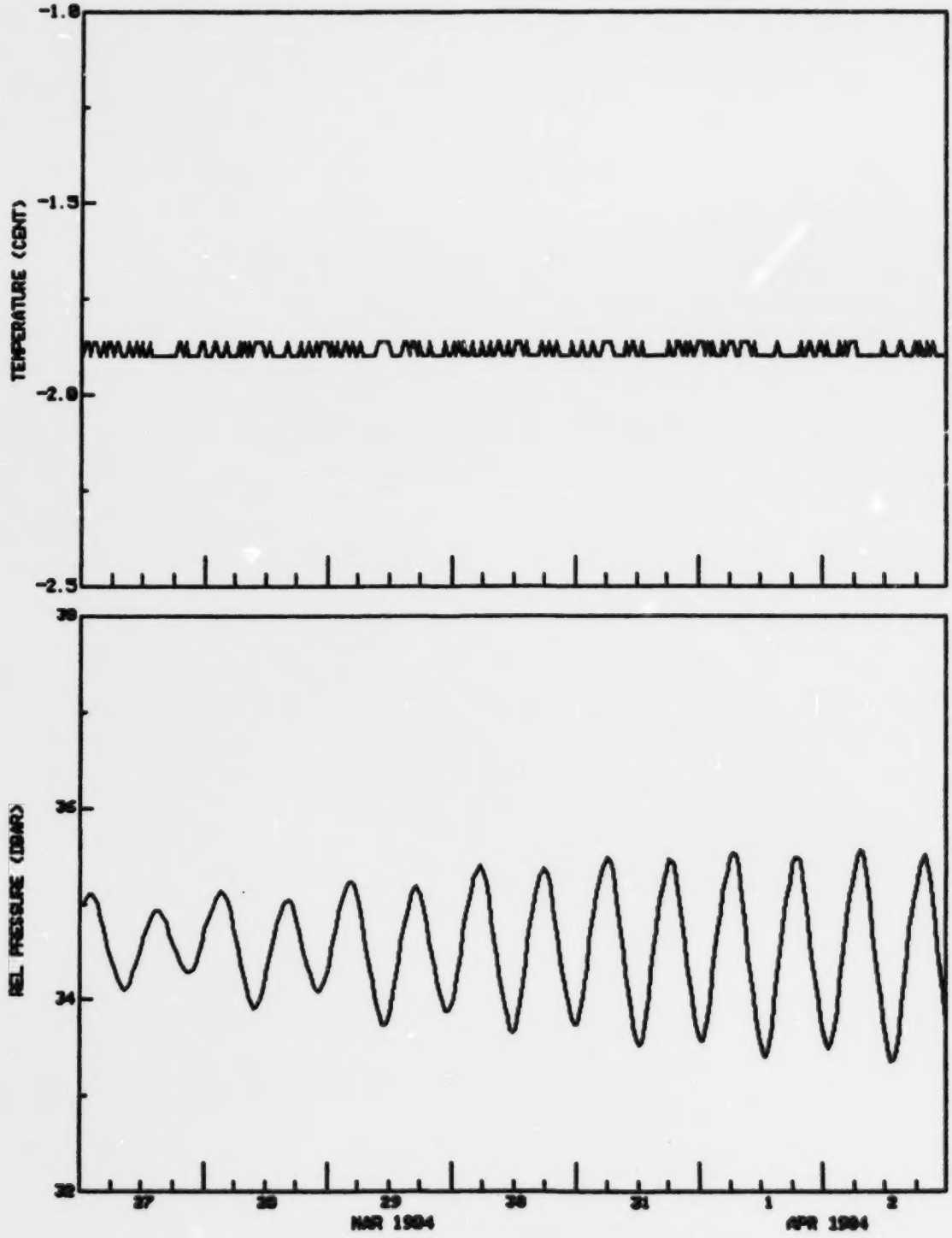
FOXE BASIN TIDAL SURVEY, 1984

SITE 08 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



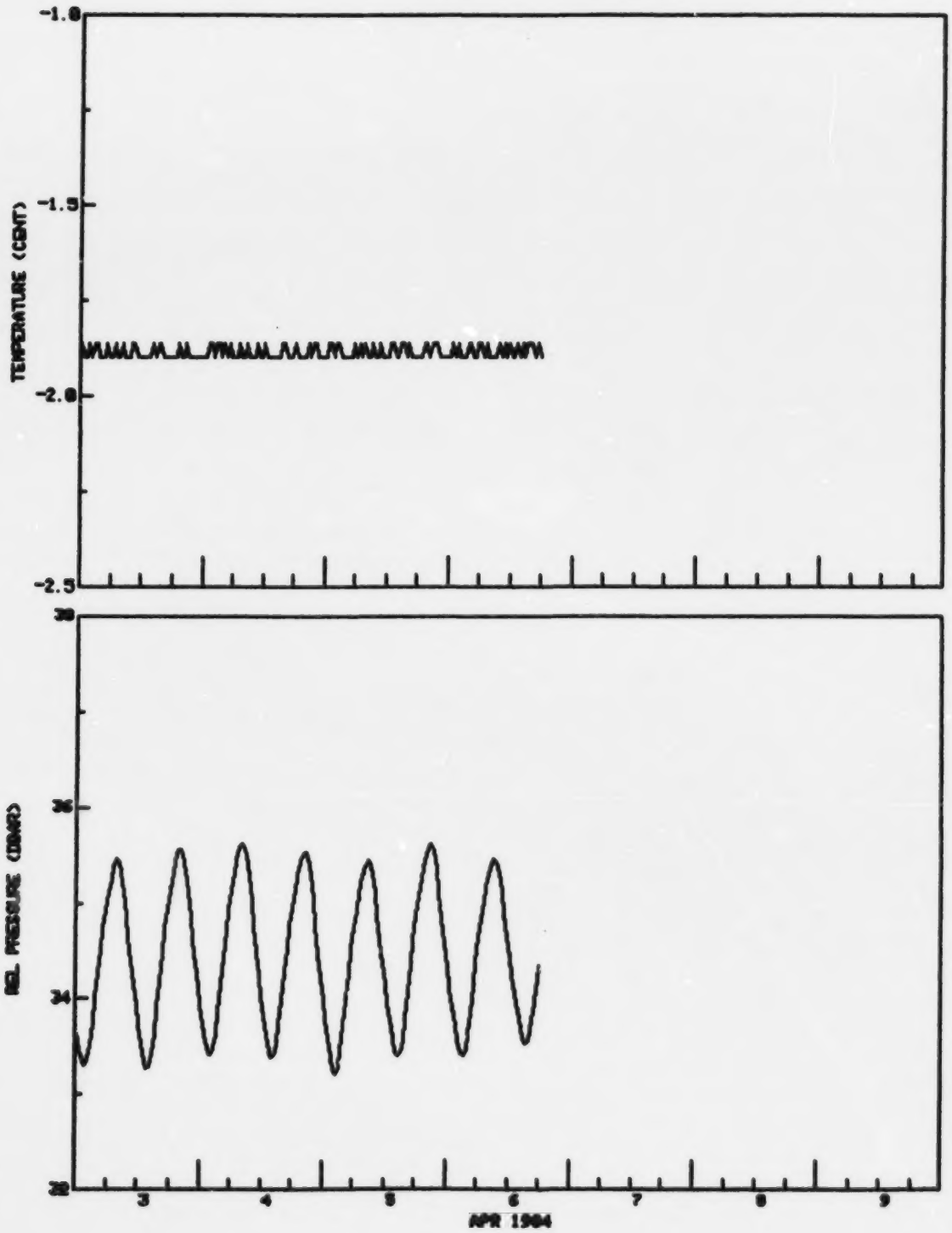
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



FOXE BASIN TIDAL SURVEY, 1984

SITE 08 AANDERAA WLR5 #336 67 6.3'N 81 22.9'W



CURRENT METER

TIME SERIES PLOTS,

HISTOGRAMS,

STICK PLOTS,

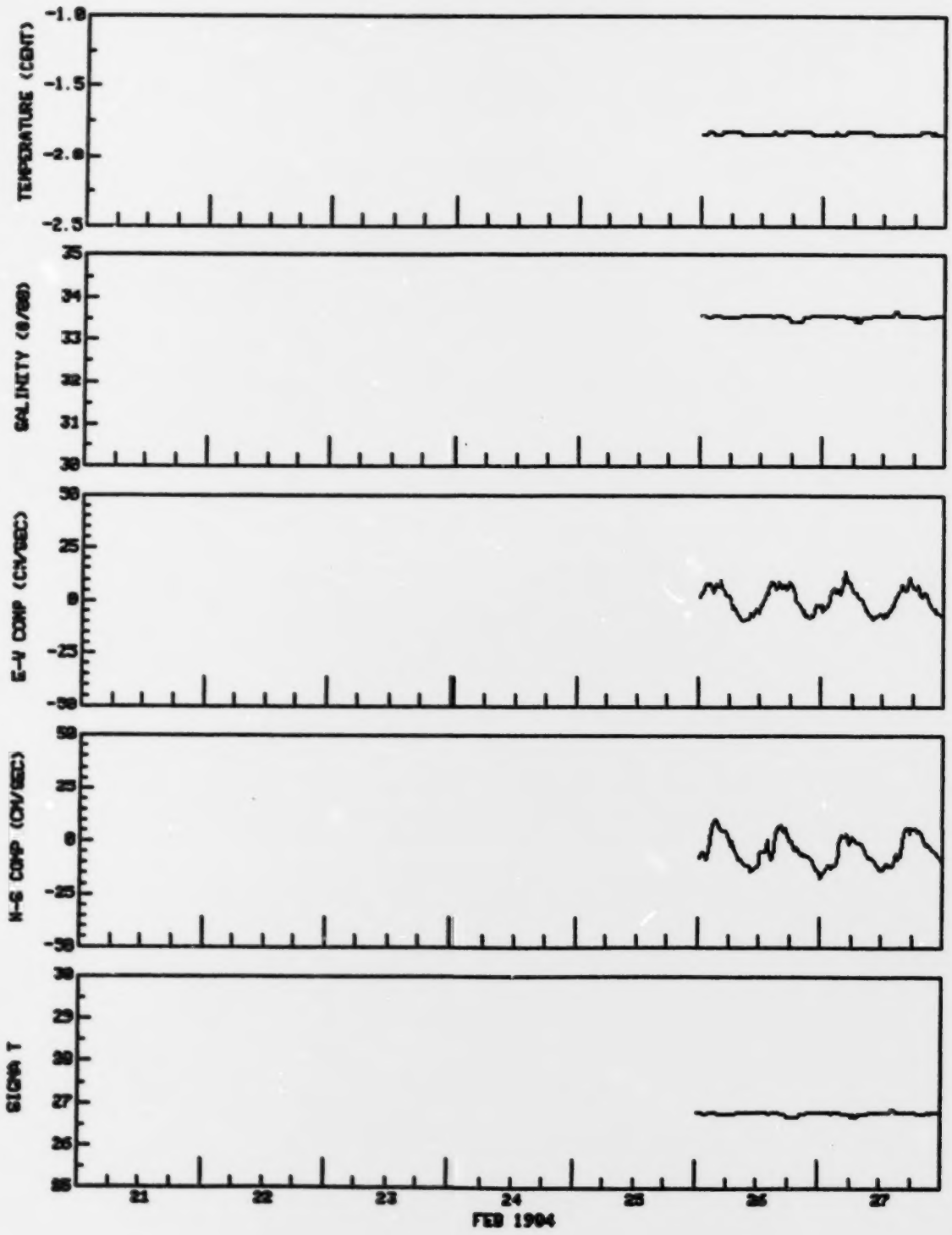
PROGRESSIVE VECTOR DIAGRAMS

1 SECTION FOR EACH CURRENT METER

SITE 1	SITE 8
TIME SERIES	TIME SERIES
HISTOGRAM	HISTOGRAM
STICK	STICK
PVD	PVD

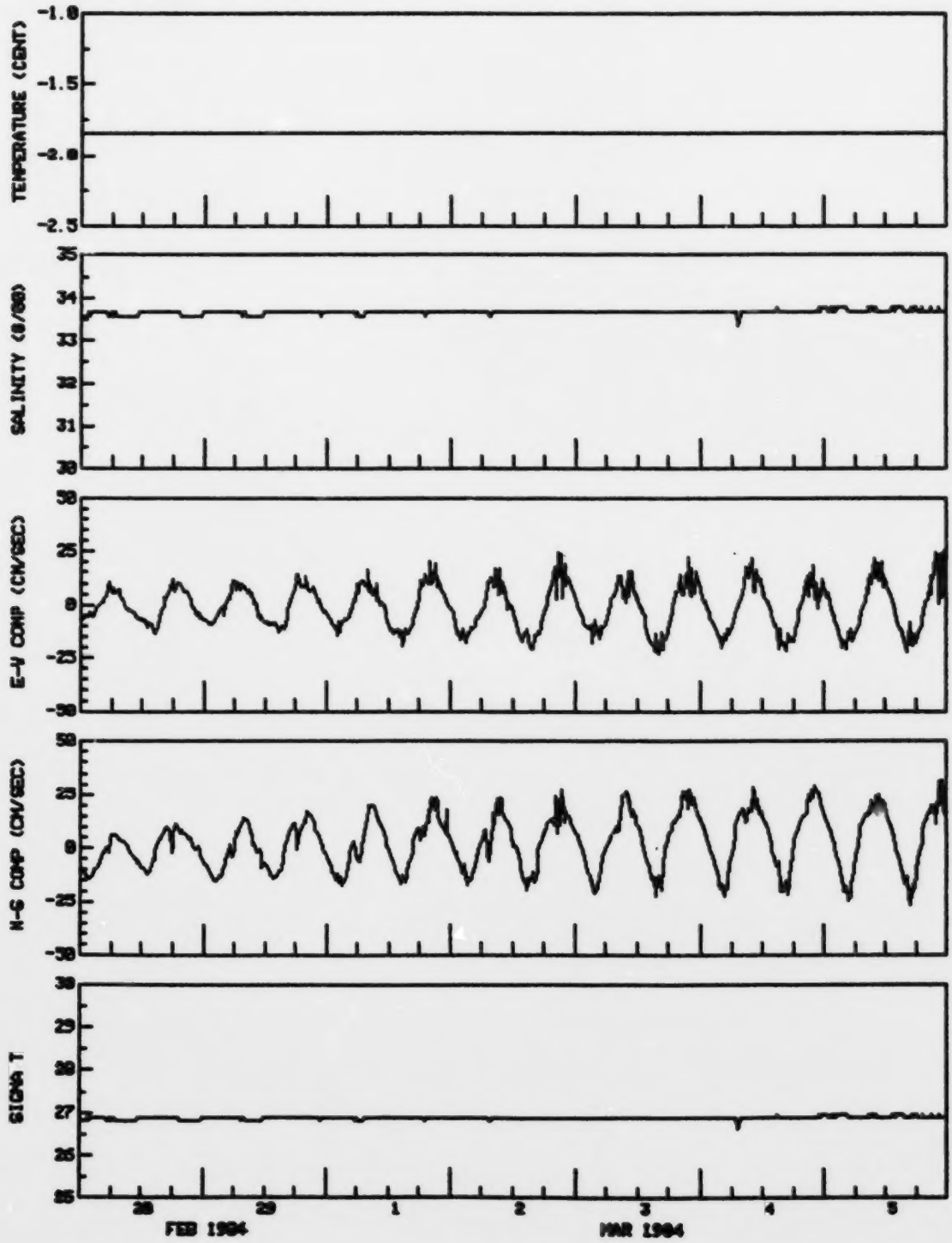
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W



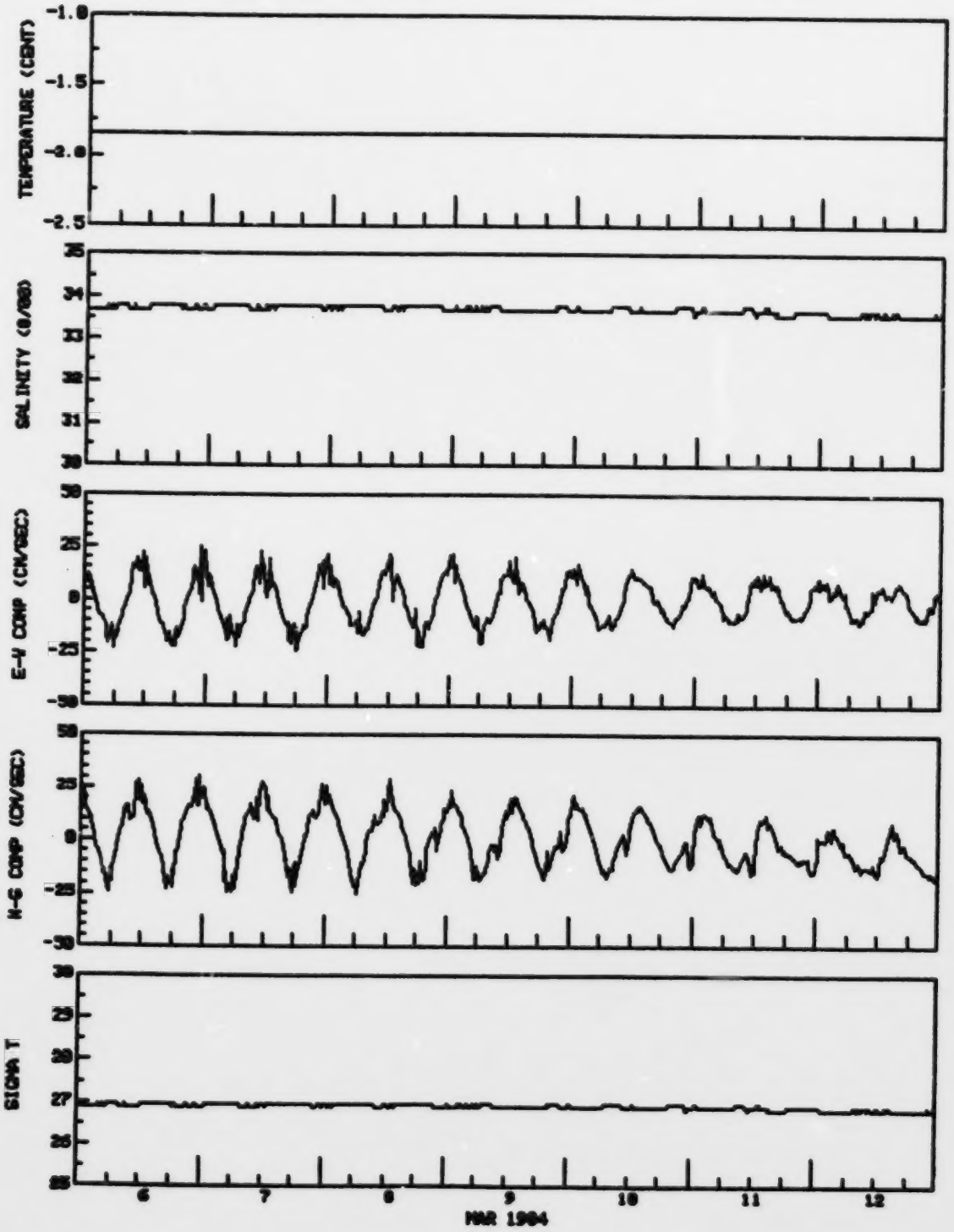
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W



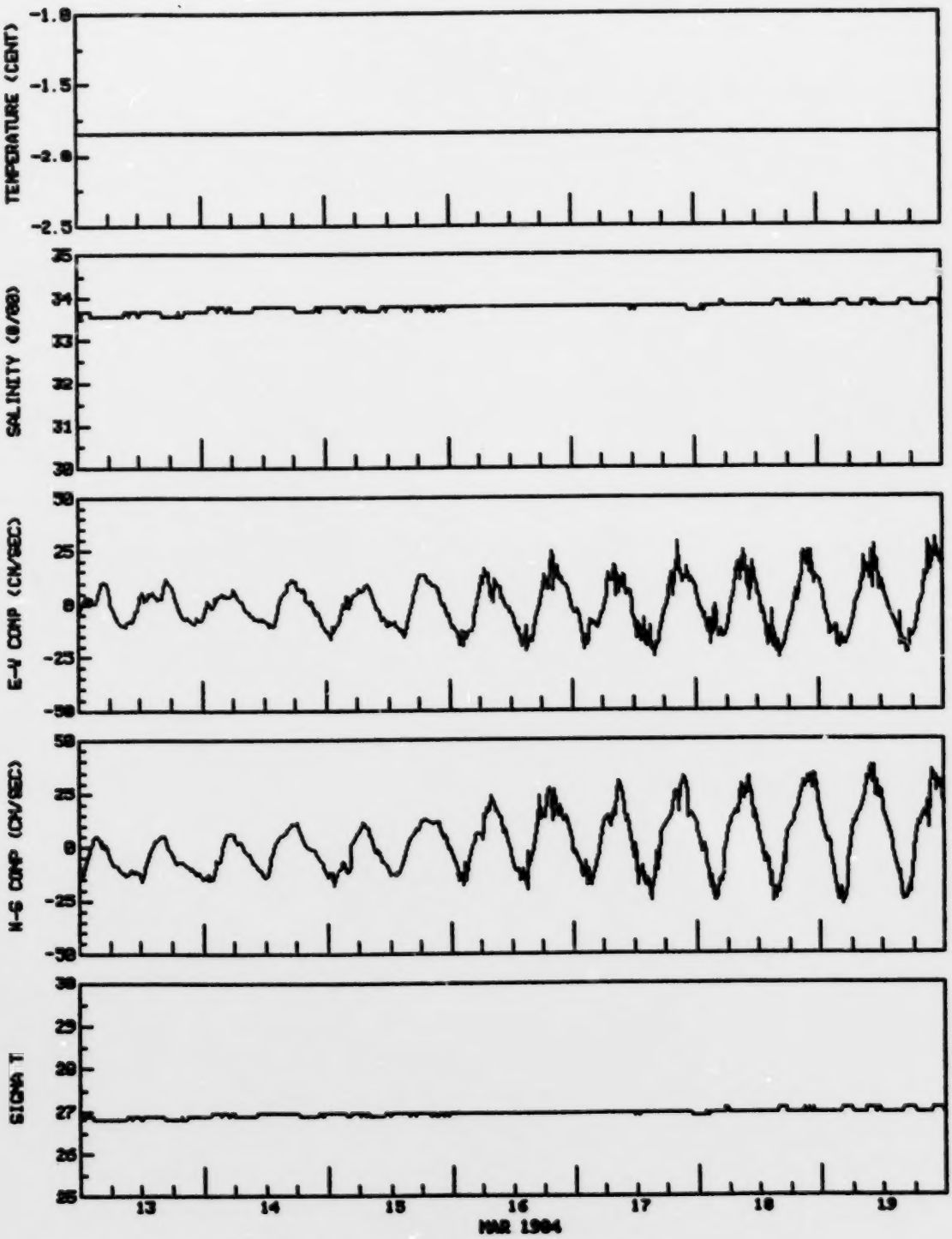
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W



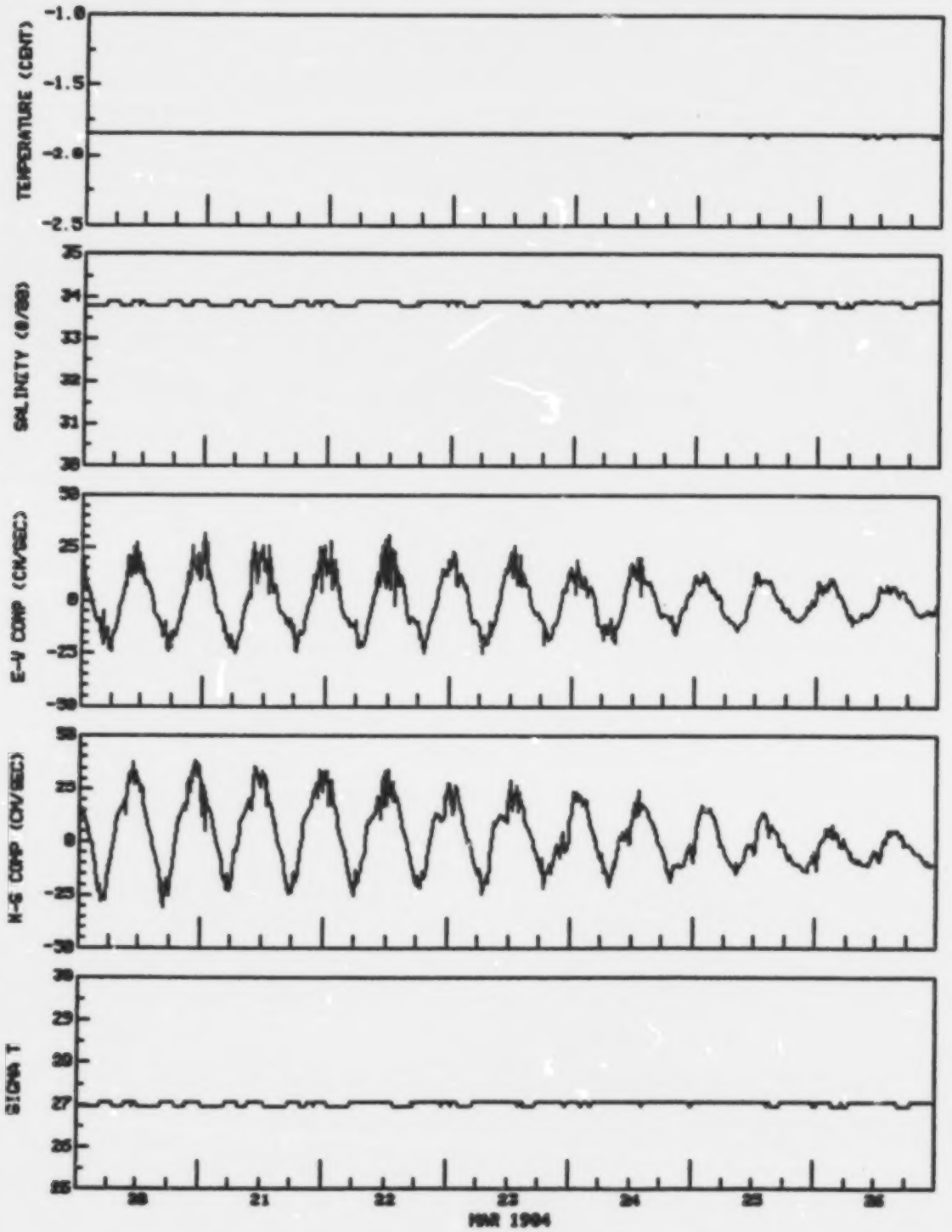
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 31.6'N 78 29.8'W



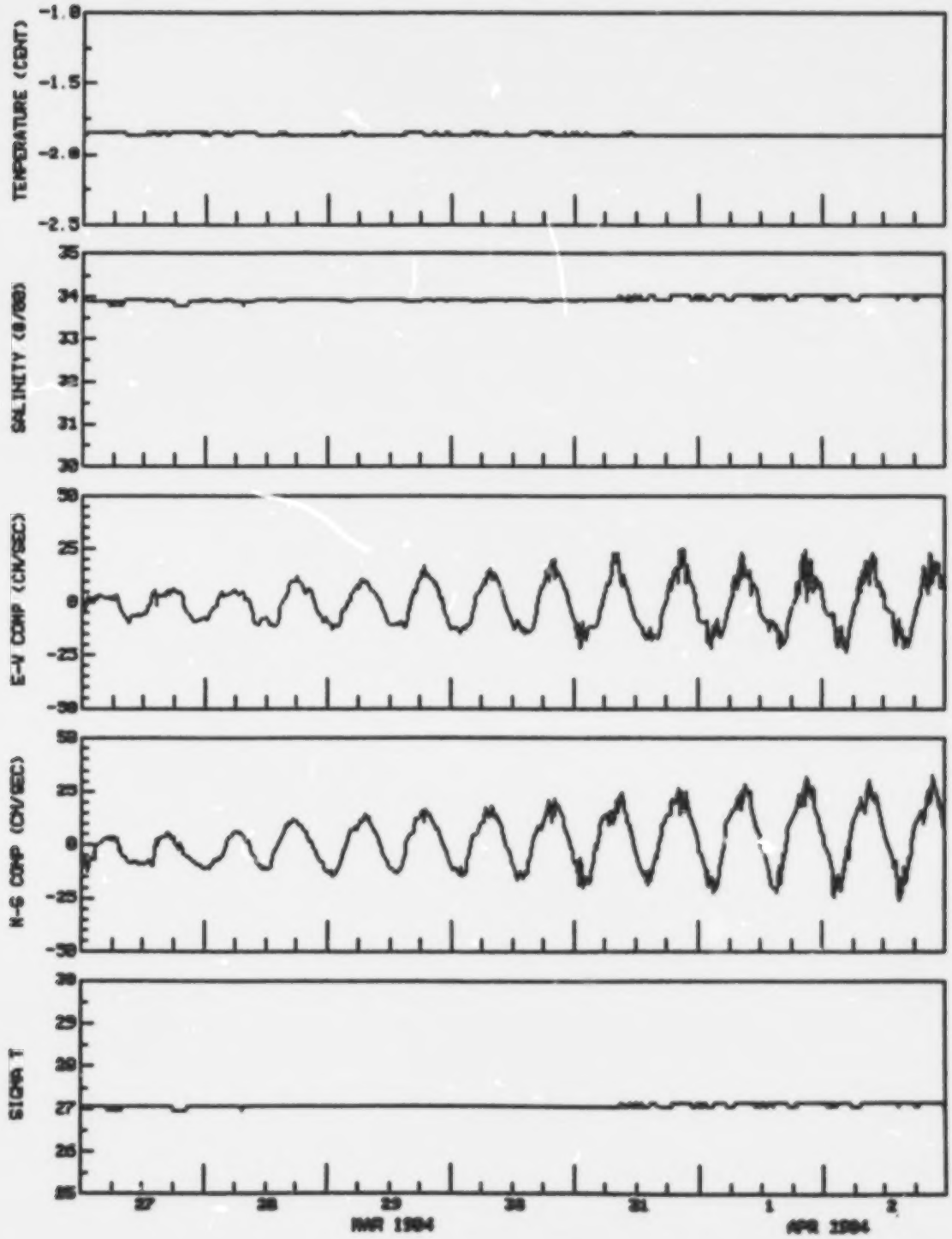
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W



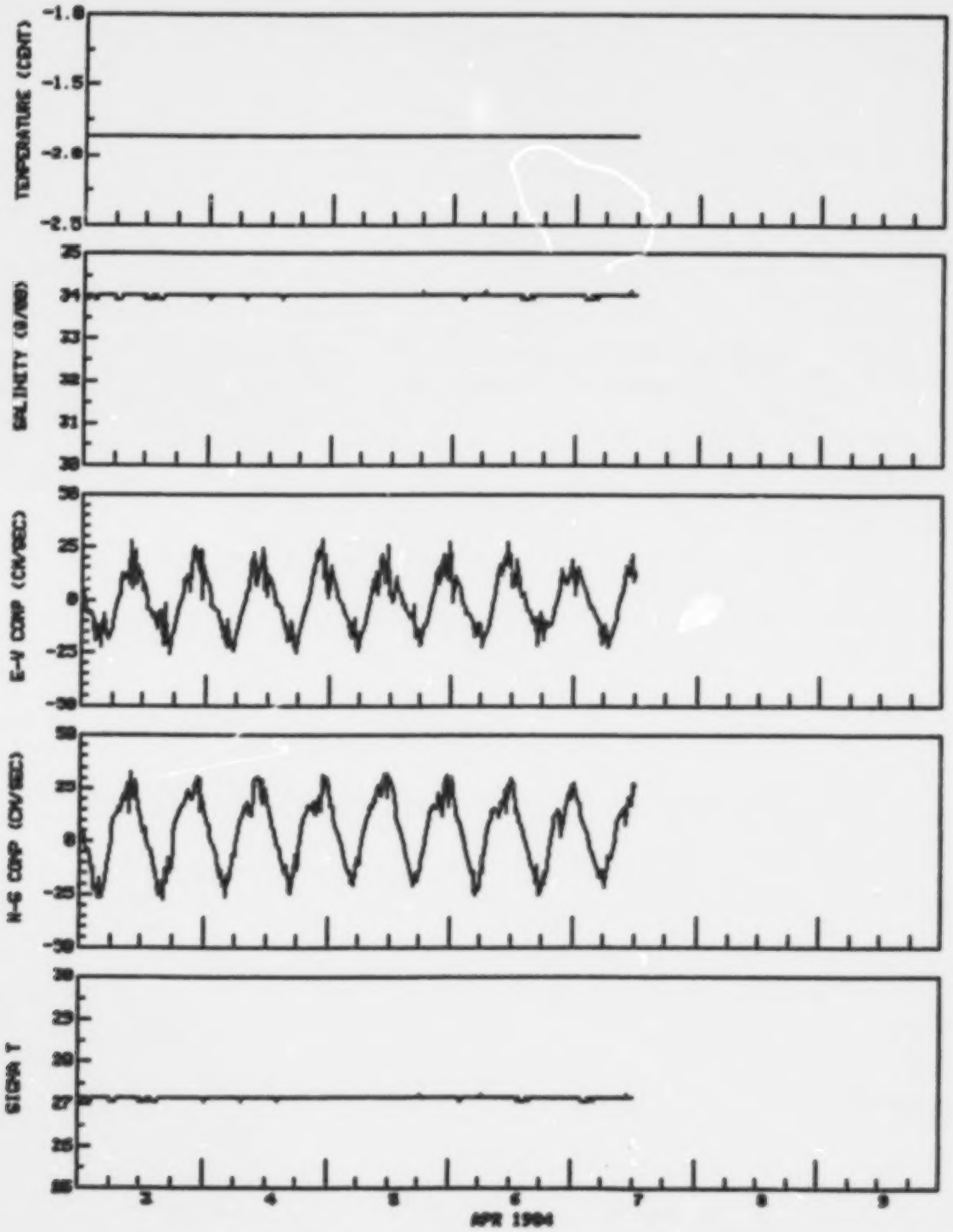
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W



FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA CM 2775 DEPTH(m) 6 69 51.6'N 78 29.8'W

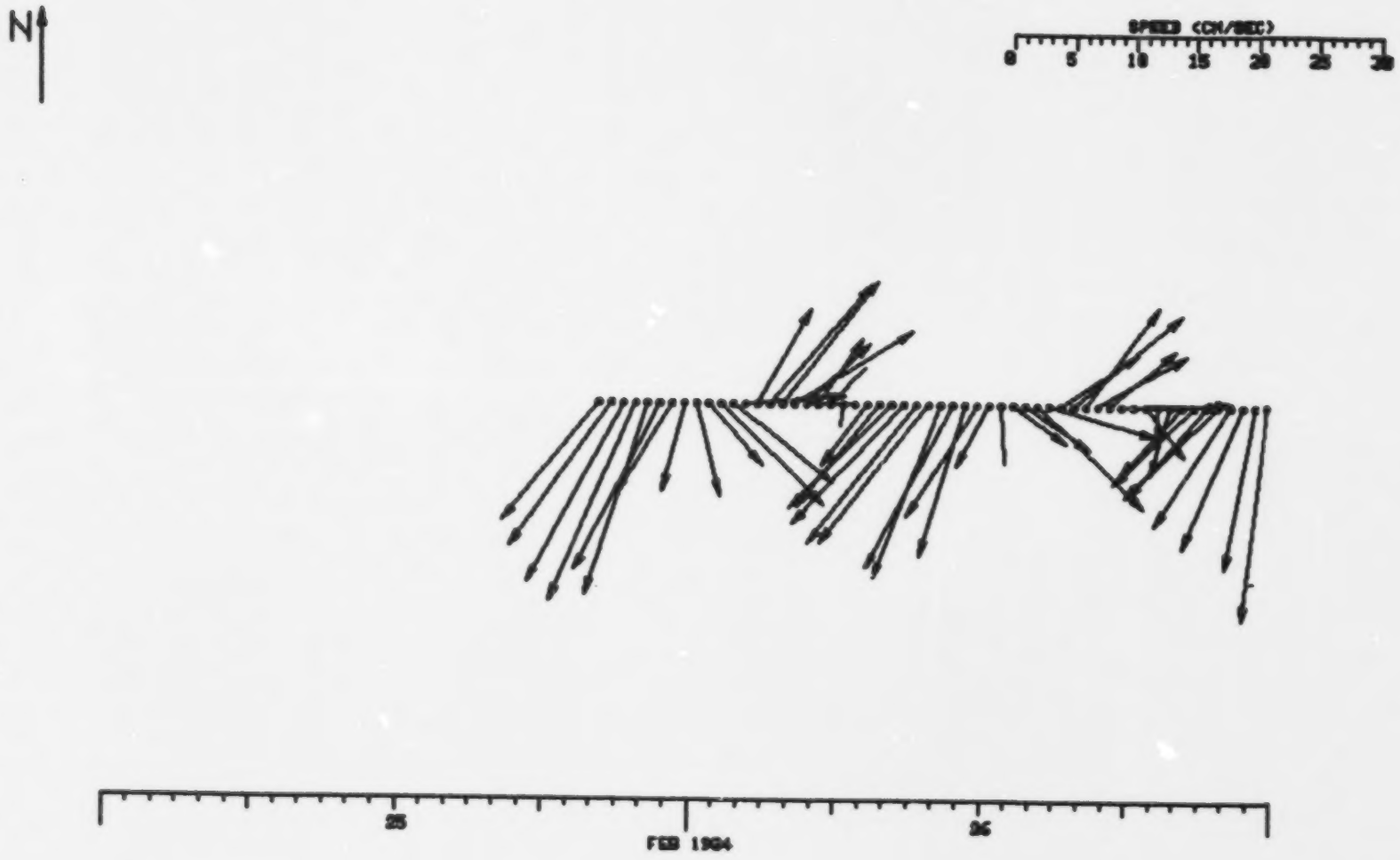


Site: FOXE BASIN Site #1
Latitude: 69 32'N Longitude: 78 38'W
Meter: 2775/17
Depth: 6 m
Sample interval 15 min.
Sample Period: 25/2/84 - 7/4/84

DIRECTION (DEG)	SPEED (CM/SEC) 0.0 to 5.0	5.0 to 10.0	10.0 to 15.0	15.0 to 20.0	20.0 to 25.0	25.0 to 30.0	30.0 to 35.0	35.0 to 40.0	40.0 to 45.0	45.0 to 50.0	
0.0 to 15.0	17	28	61	43	28	36	15	3			241
15.0 to 30.0	12	49	69	90	74	64	39	21	1		419
30.0 to 45.0	28	91	133	154	89	54	31	21	1		602
45.0 to 60.0	15	49	41	48	42	37	31	5			268
60.0 to 75.0	13	38	15	7	5	12	7	1			98
75.0 to 90.0	13	25	13	1		1					53
90.0 to 105.0	16	16	13	2							47
105.0 to 120.0	17	8	9								34
120.0 to 135.0	10	18	15								43
135.0 to 150.0	9	12	9	2							31
150.0 to 165.0	11	20	15	11							57
165.0 to 180.0	9	26	11	5							51
180.0 to 195.0	12	15	22	7	5	10					71
195.0 to 210.0	10	21	60	32	36	33	4				196
210.0 to 225.0	13	75	283	168	78	59	7				683
225.0 to 240.0	22	75	92	92	94	60	5				420
240.0 to 255.0	21	56	71	57	30	10					245
255.0 to 270.0	17	24	40	16	7	2					106
270.0 to 285.0	10	36	37	10							101
285.0 to 300.0	16	10	14	4							32
300.0 to 315.0	16	21	24								61
315.0 to 330.0	9	19	24								52
330.0 to 345.0	12	26	38								76
345.0 to 360.0	8	31	37	1	1	3	2				83
	343	987	1865	748	479	391	141	51	2	0	4918

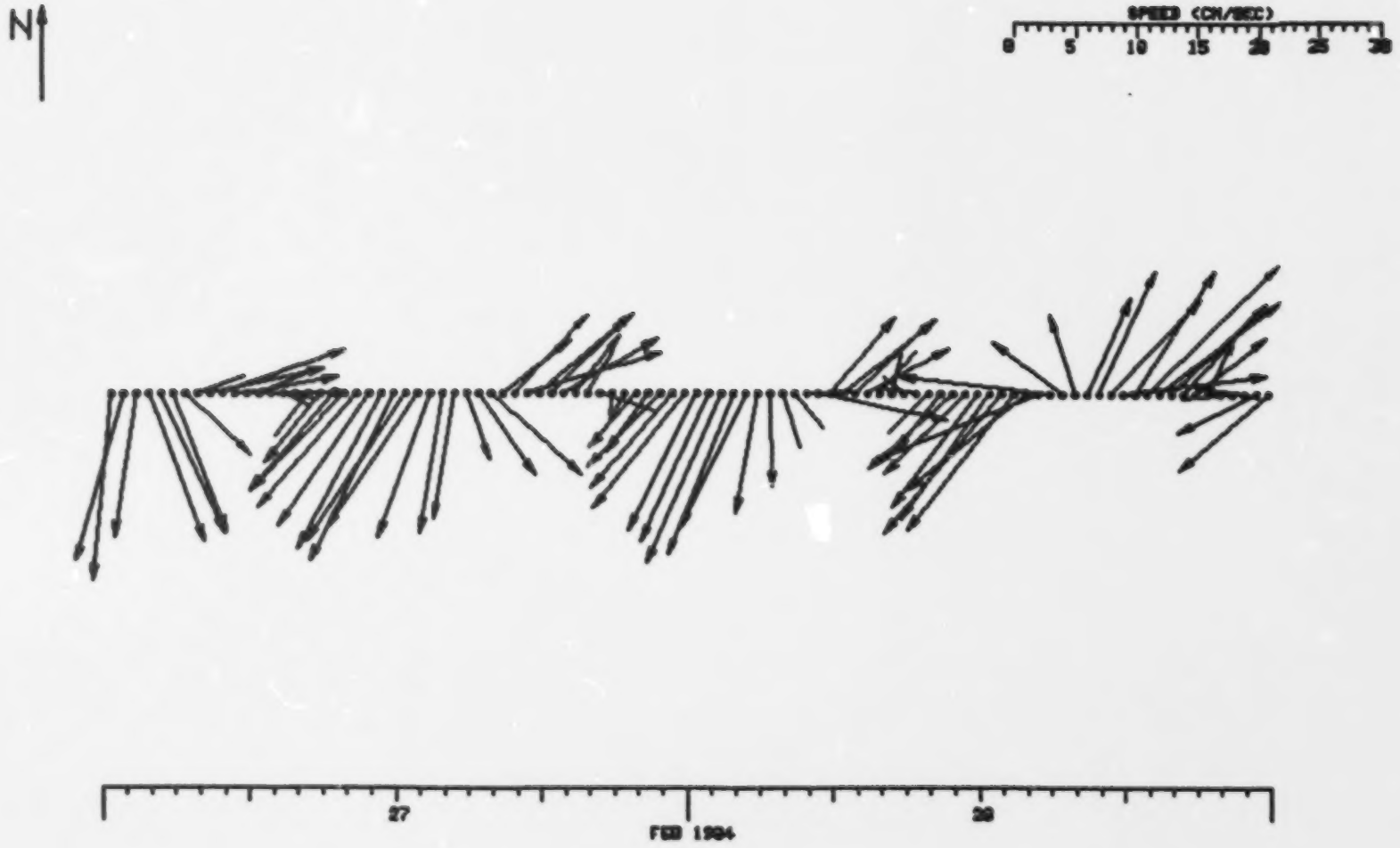
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W



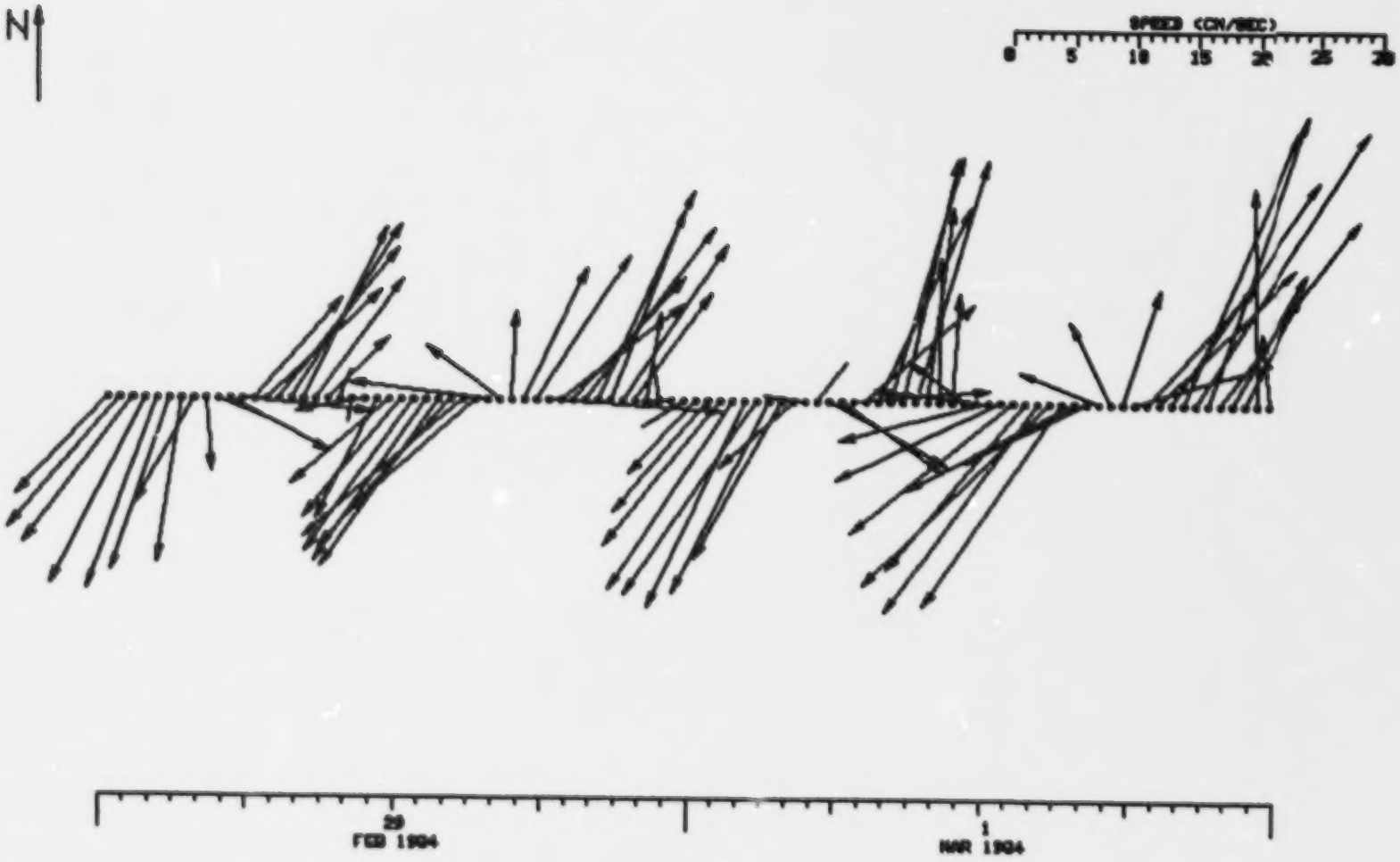
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2773 69 51.6'N 78 29.8'W



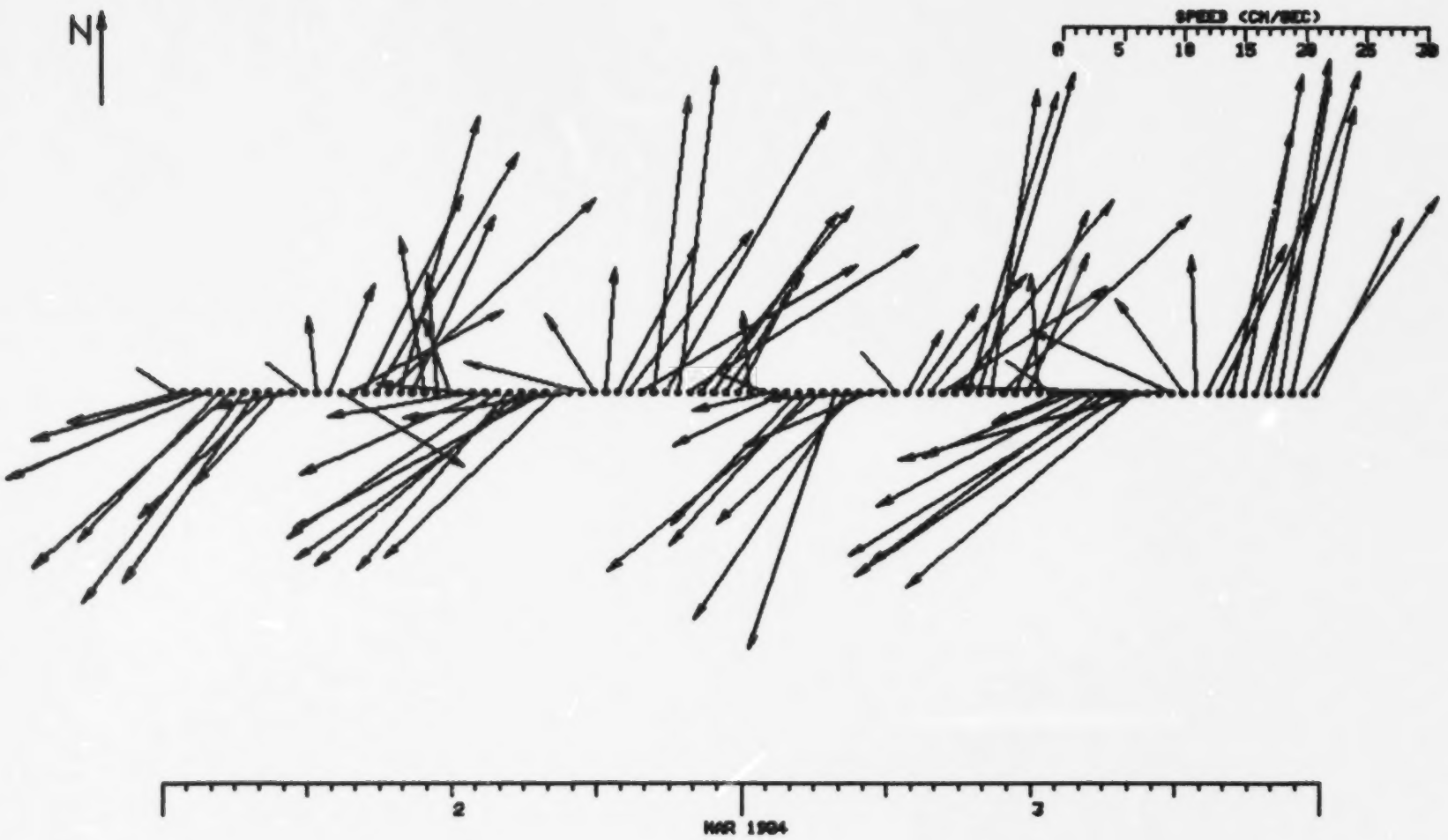
FOXE BASIN TIDAL SURVEY, 1984

SITE 81 AANDERAA RCM4 #2773 69 31.6'N 78 29.8'W



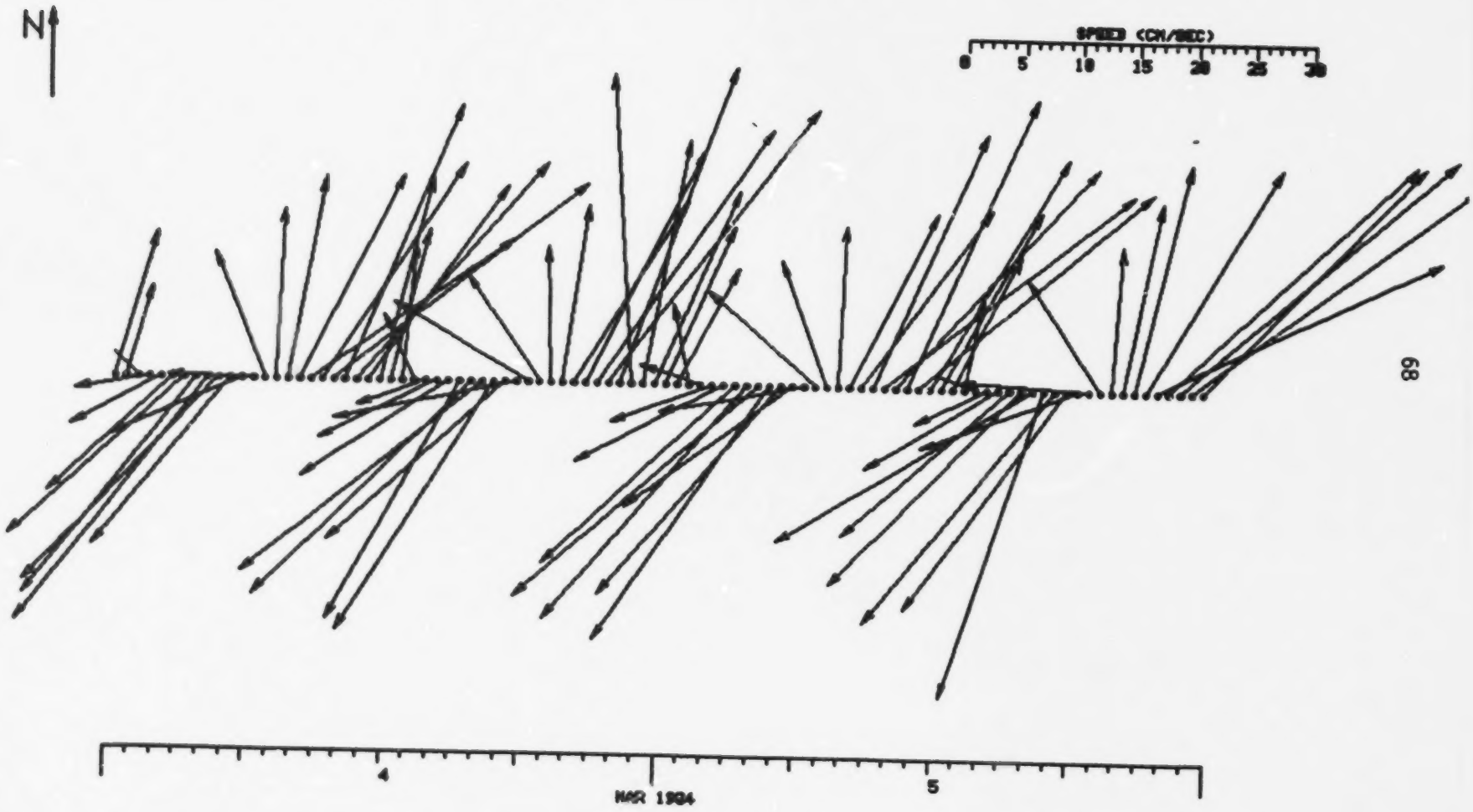
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W



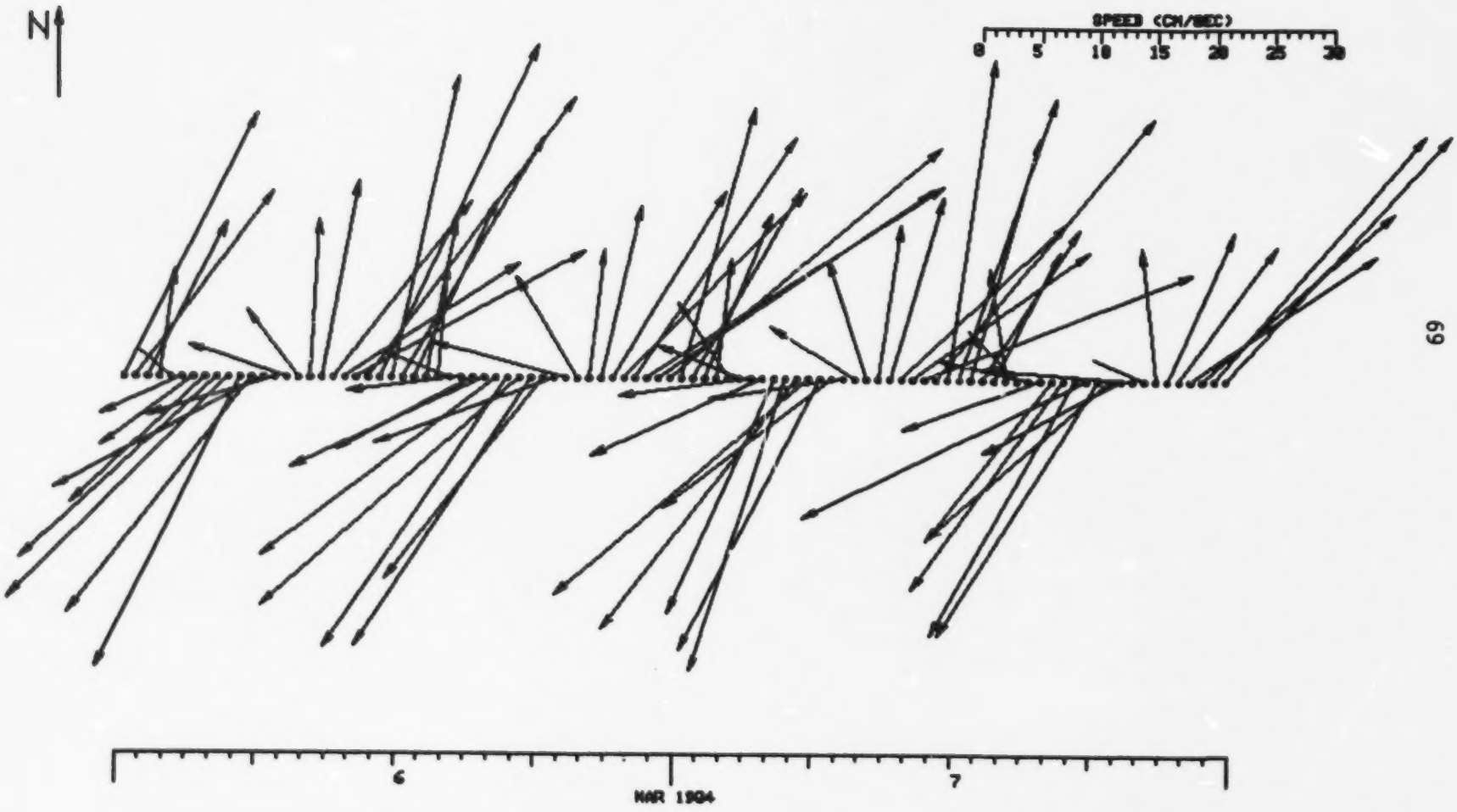
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



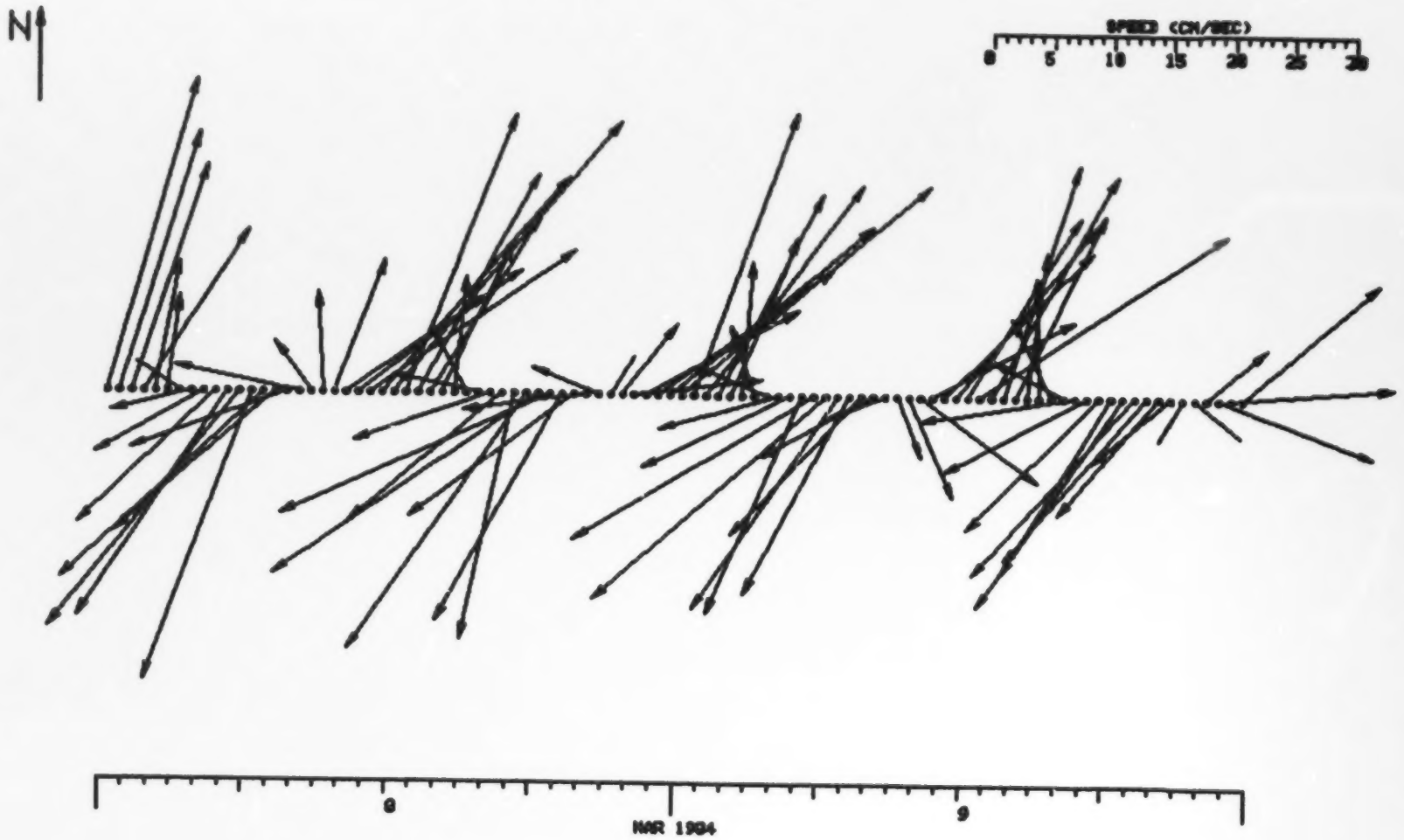
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



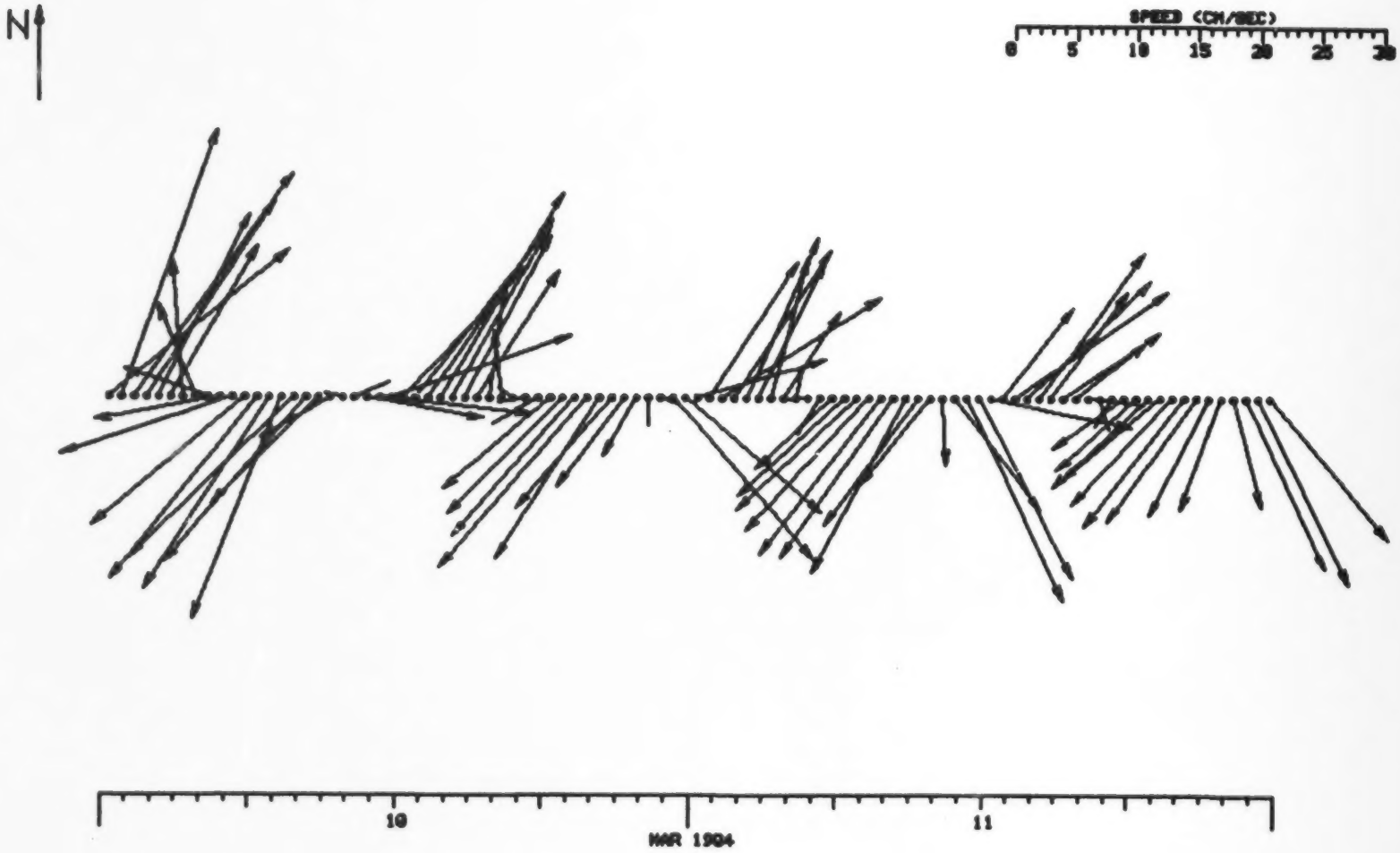
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2773 69 31.6'N 78 29.8'W



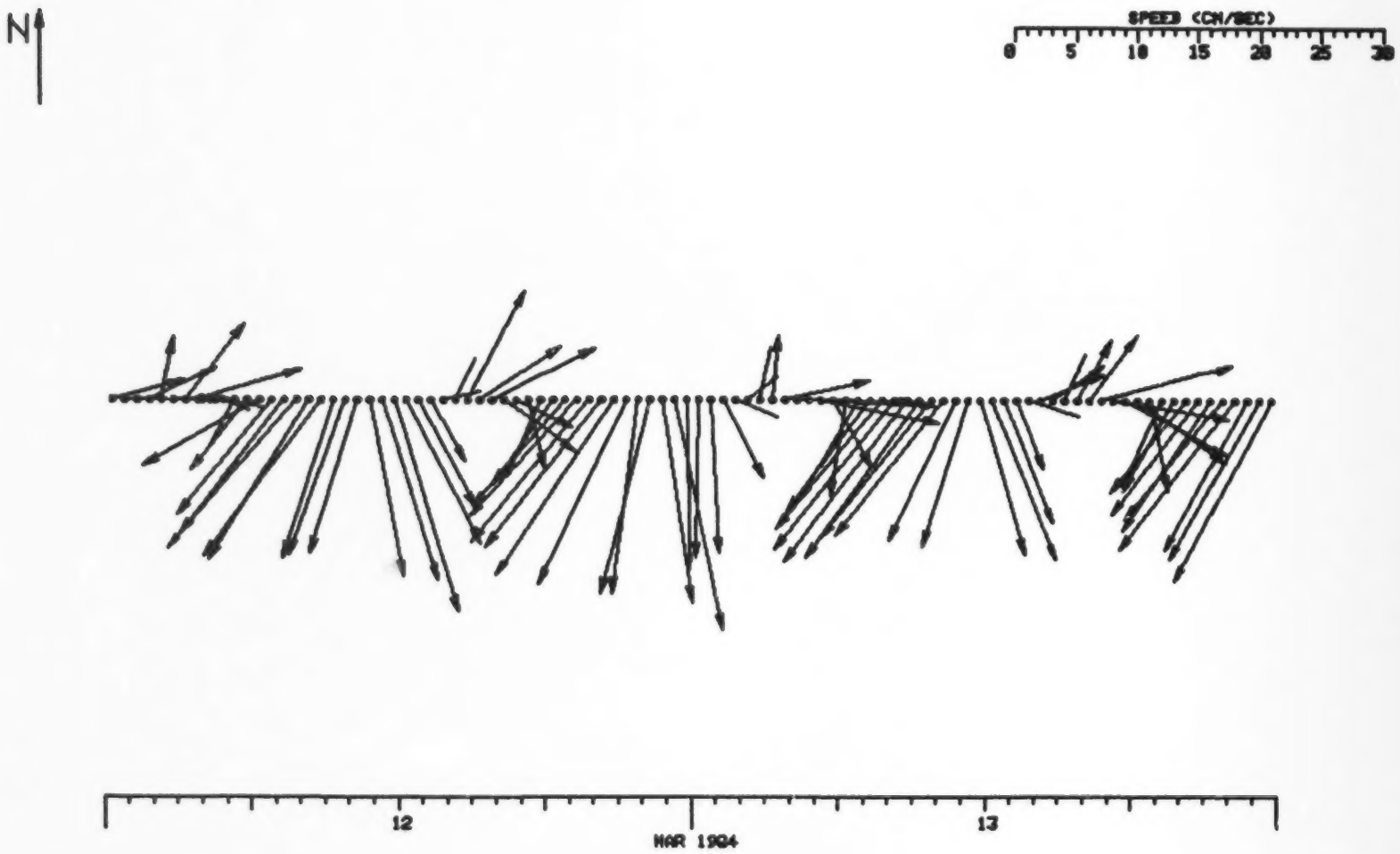
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



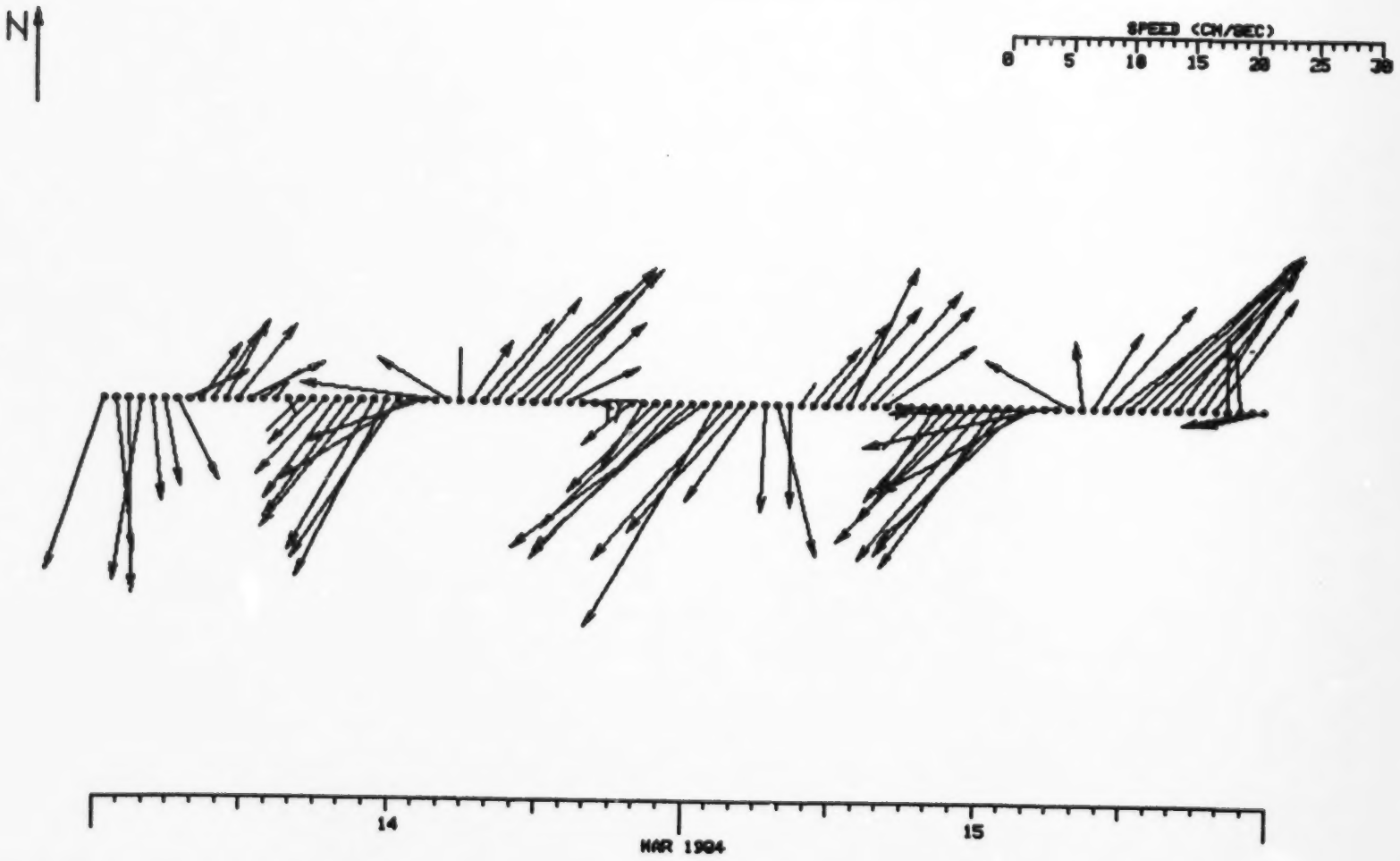
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



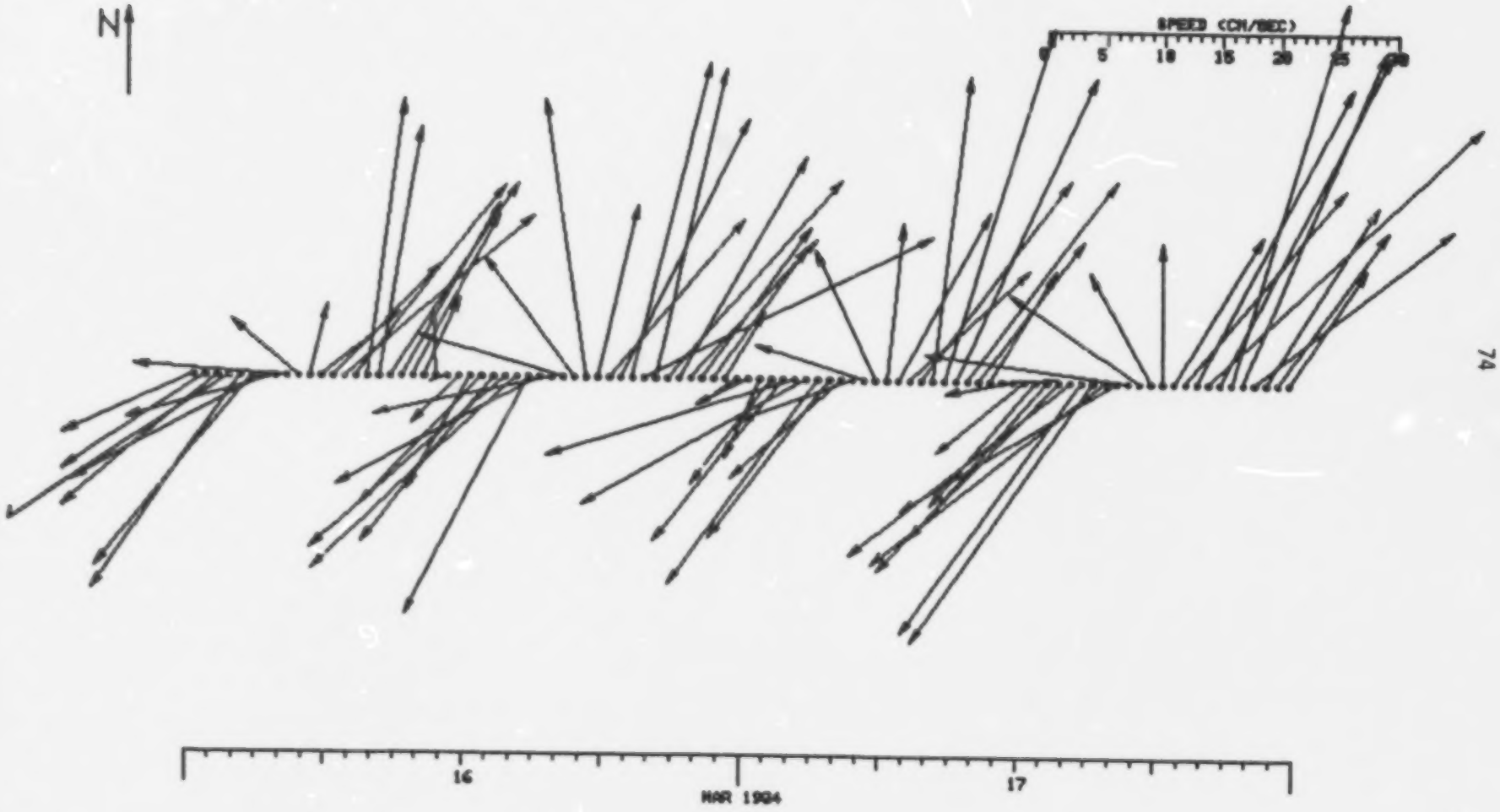
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W



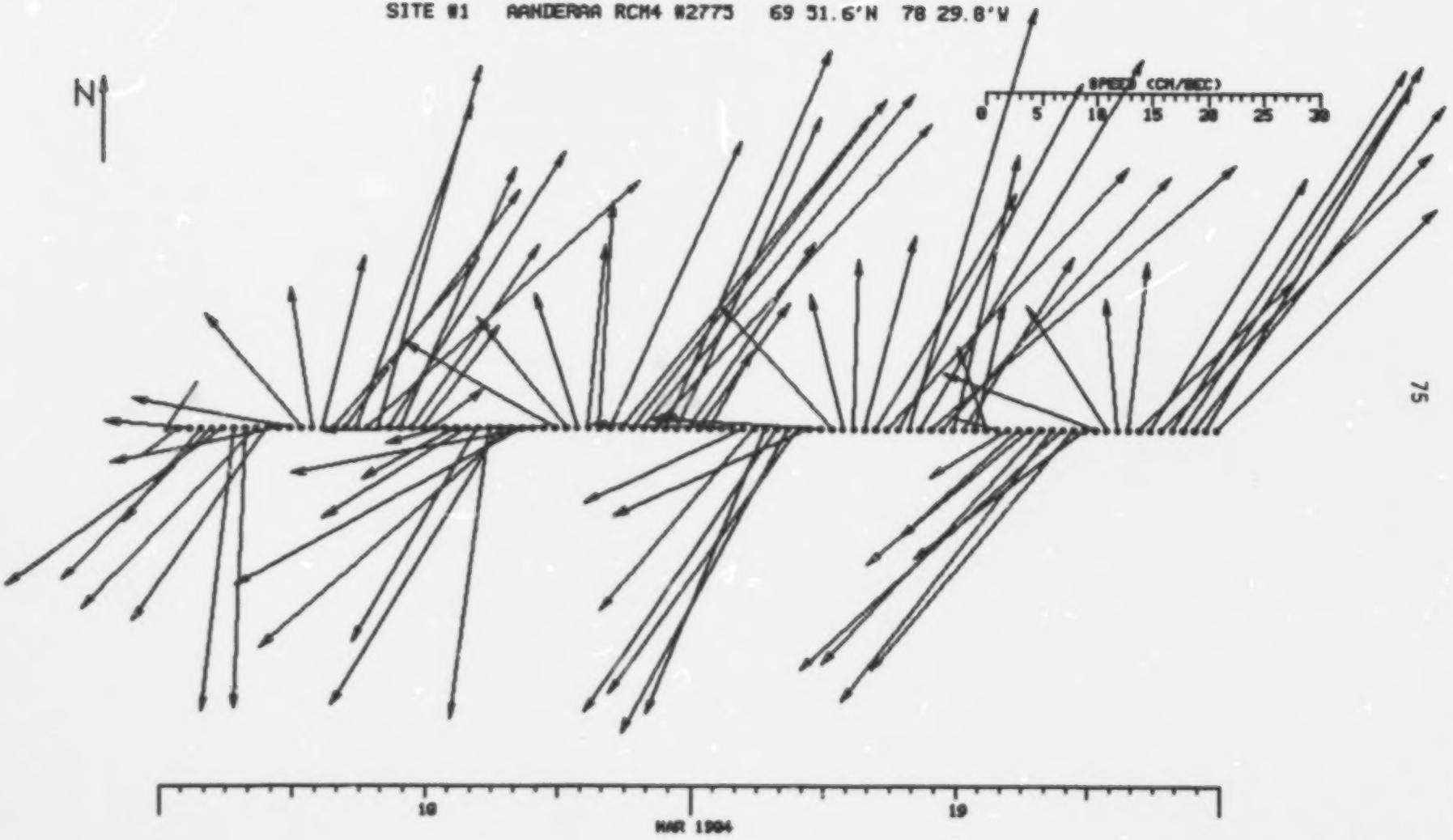
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



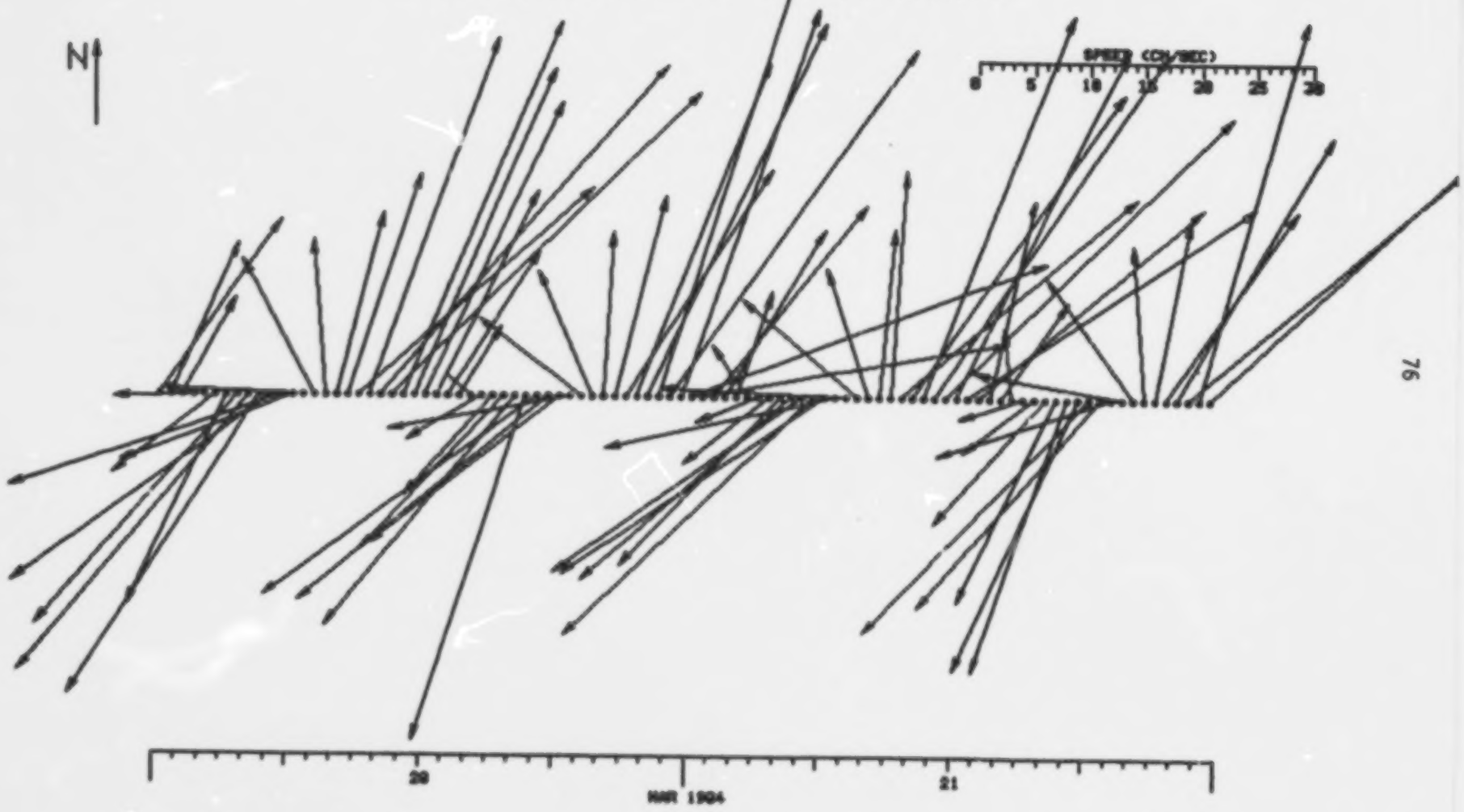
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2773 69 31.6'N 78 29.8'W



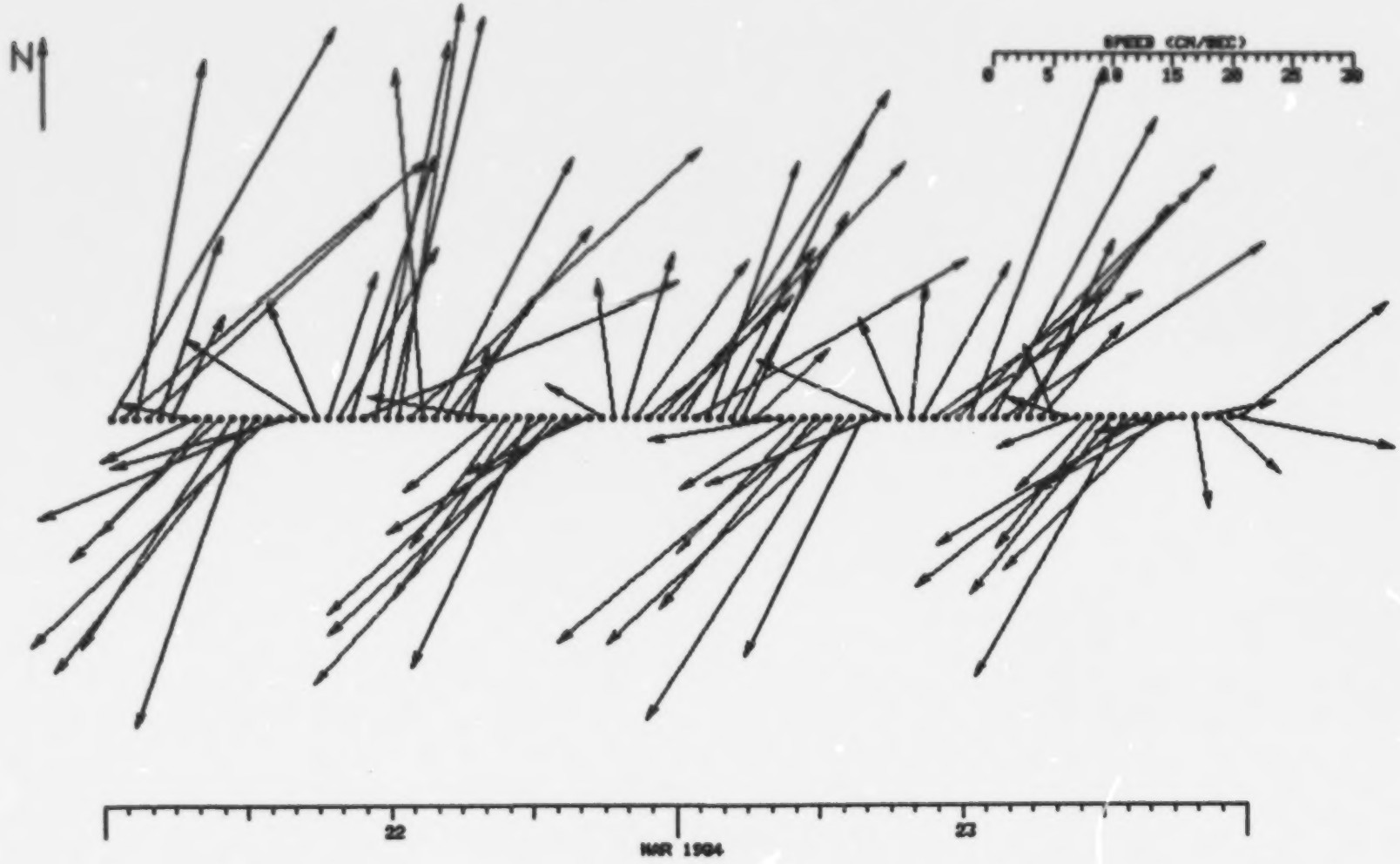
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2773 69 51.6'N 78 29.8'W



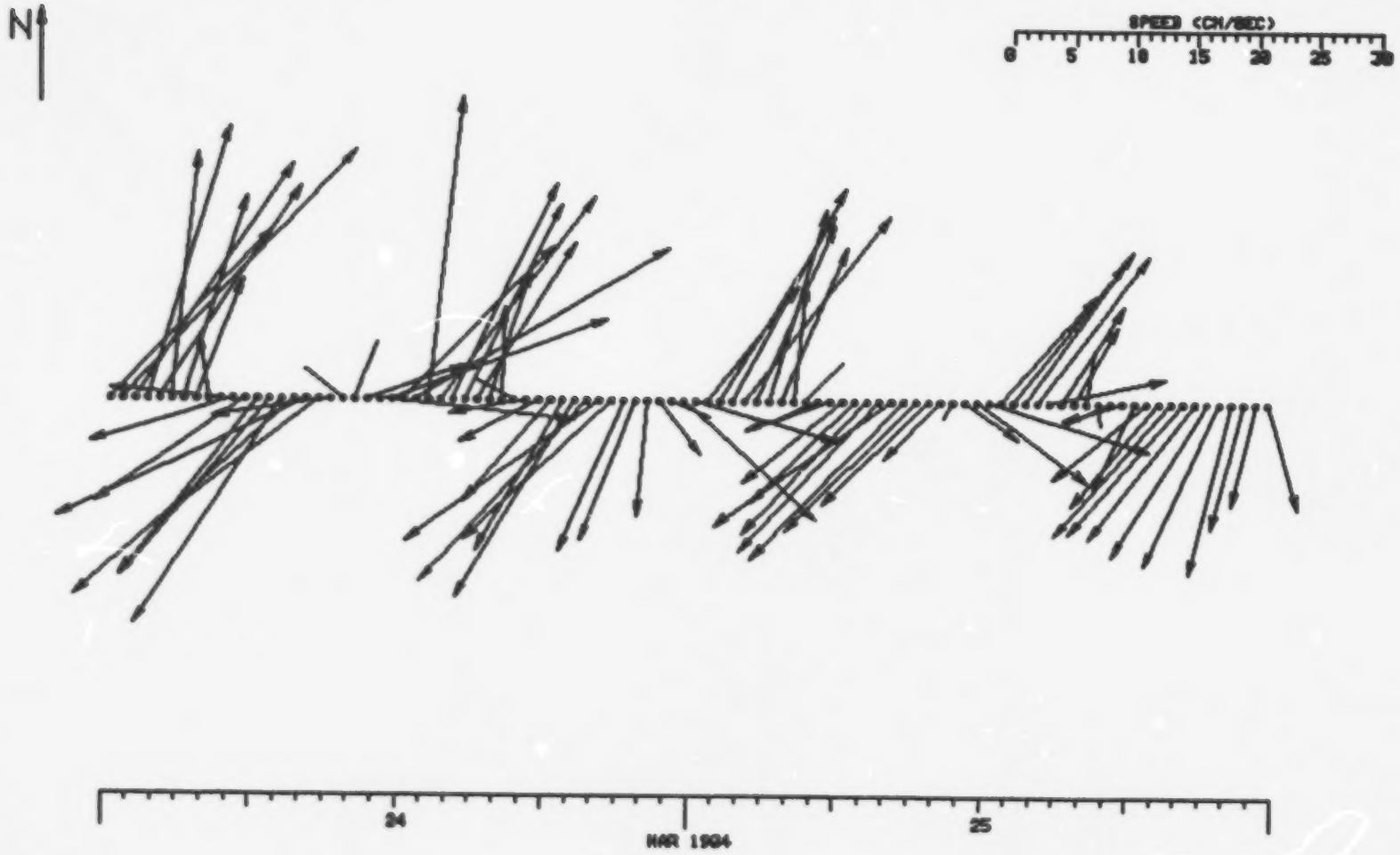
FOXE BASIN TIDAL SURVEY, 1984

SITE 81 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W



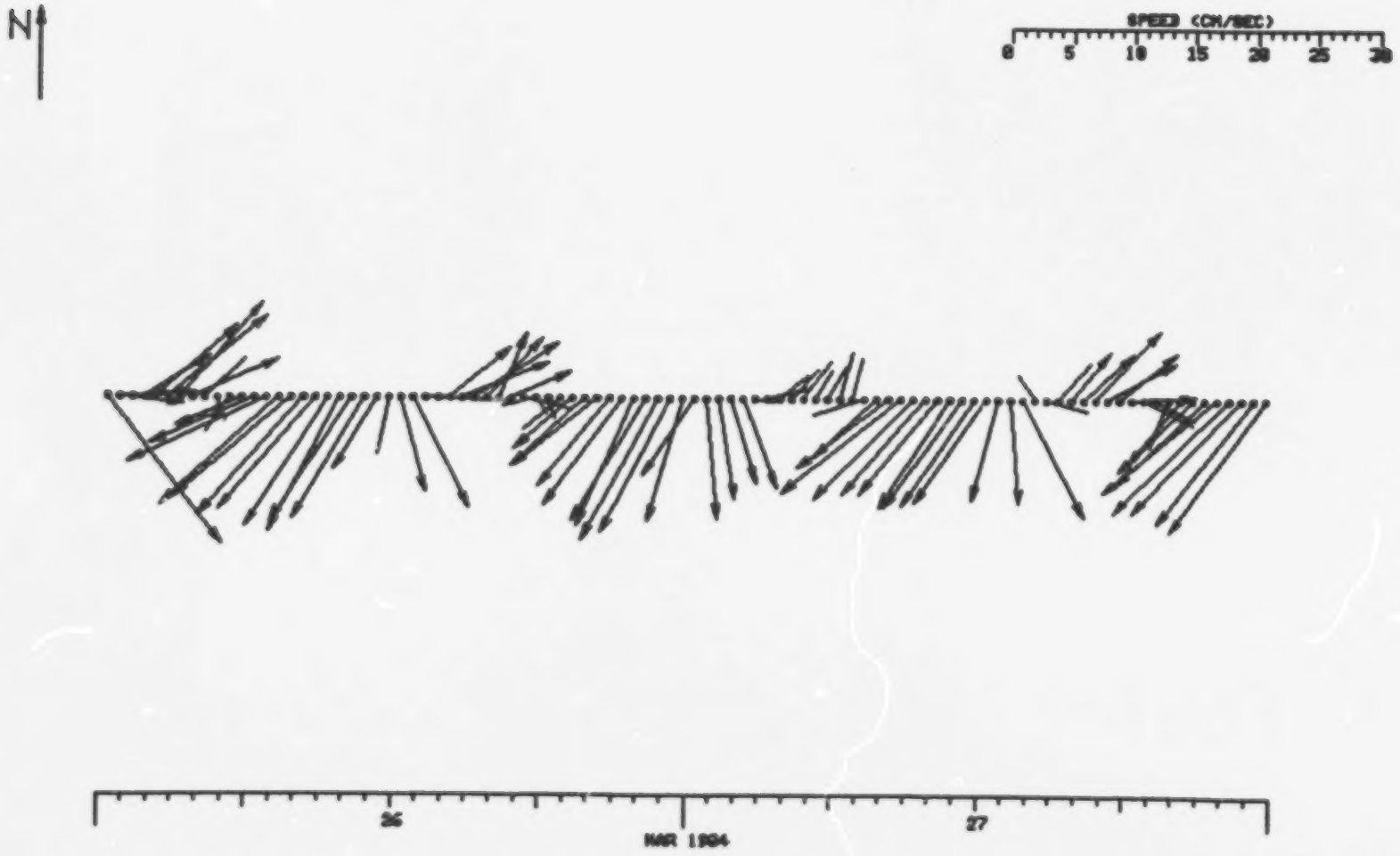
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



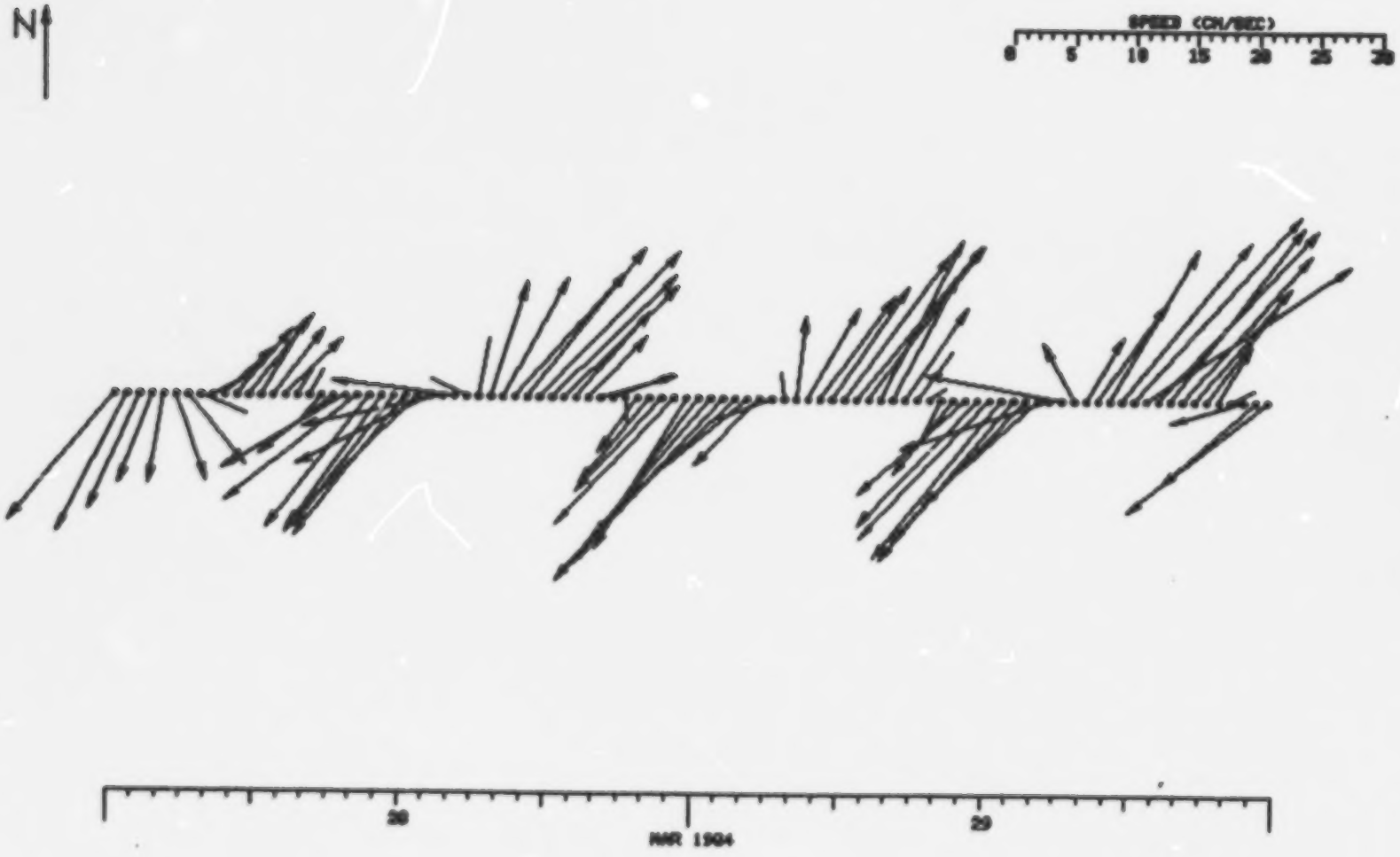
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W



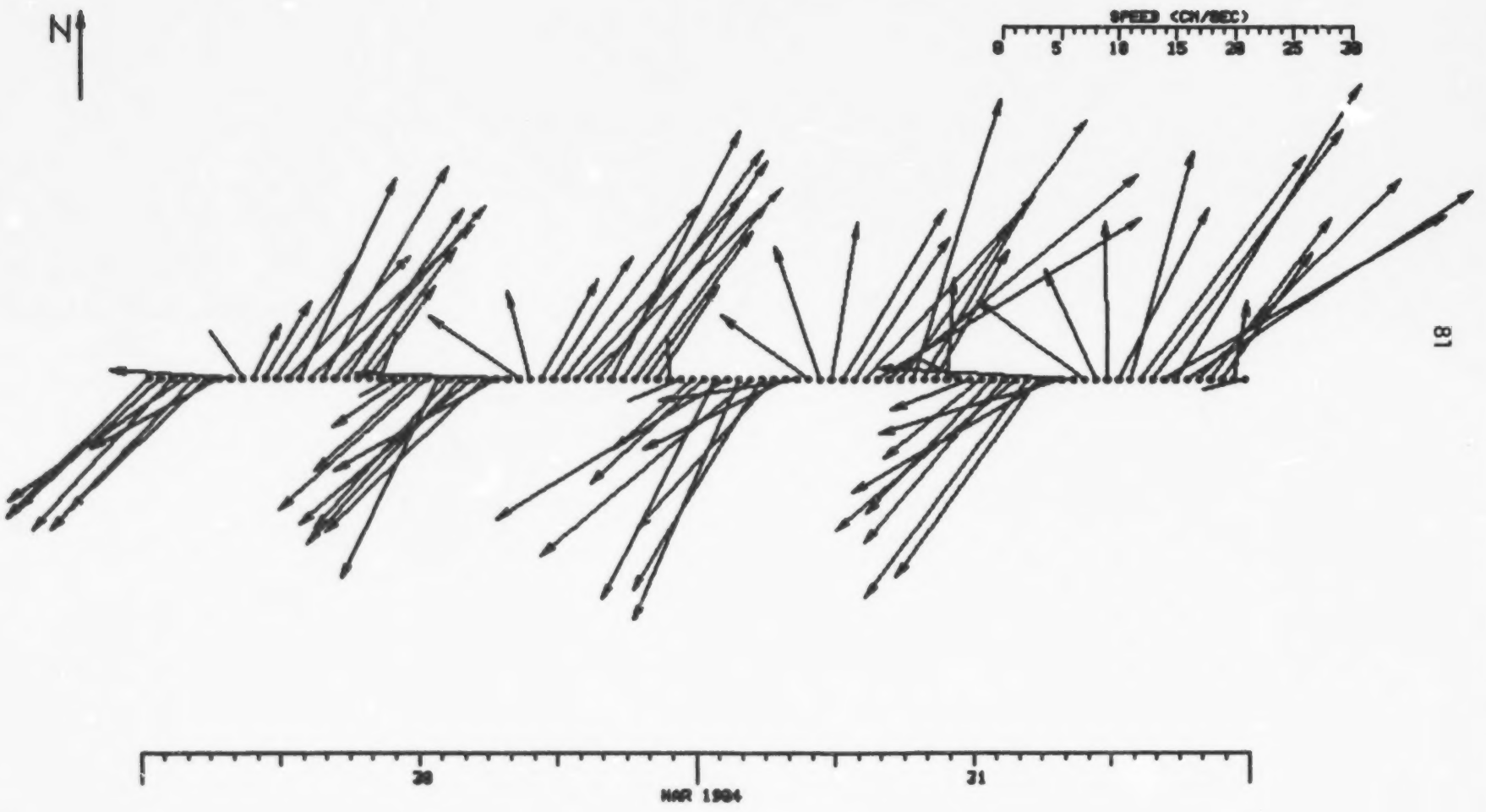
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2773 69 31.6'N 78 29.8'W



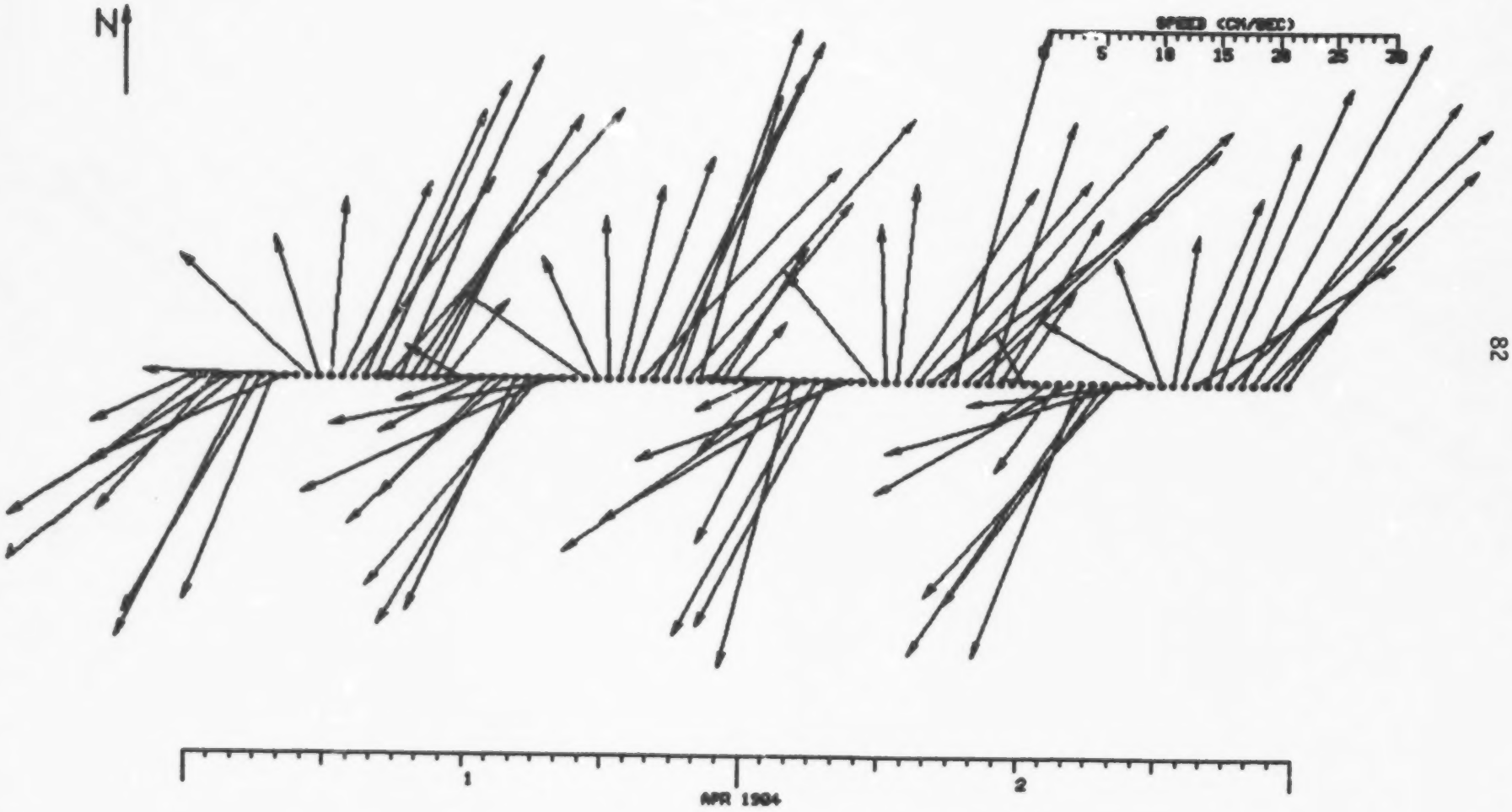
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



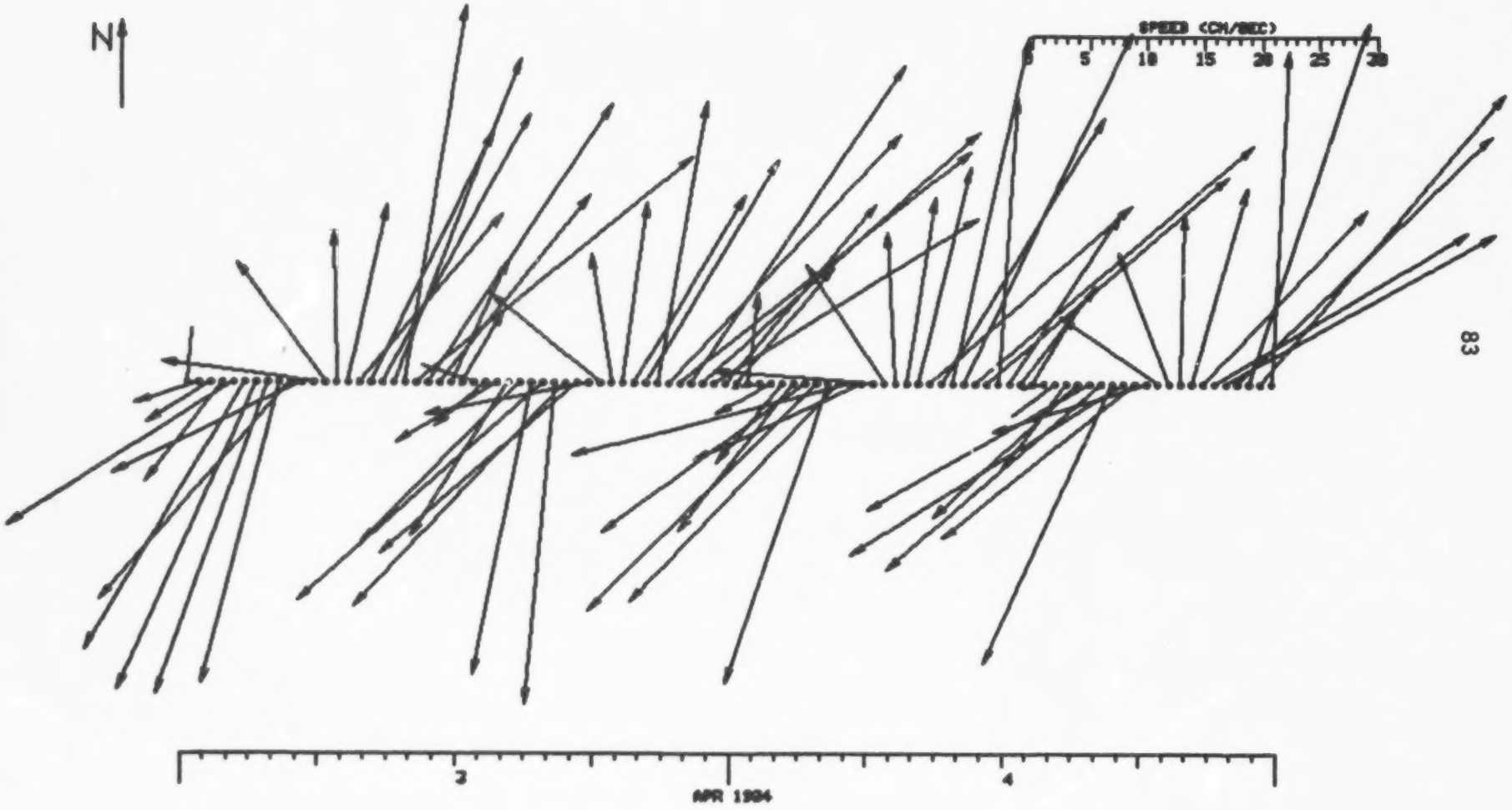
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W



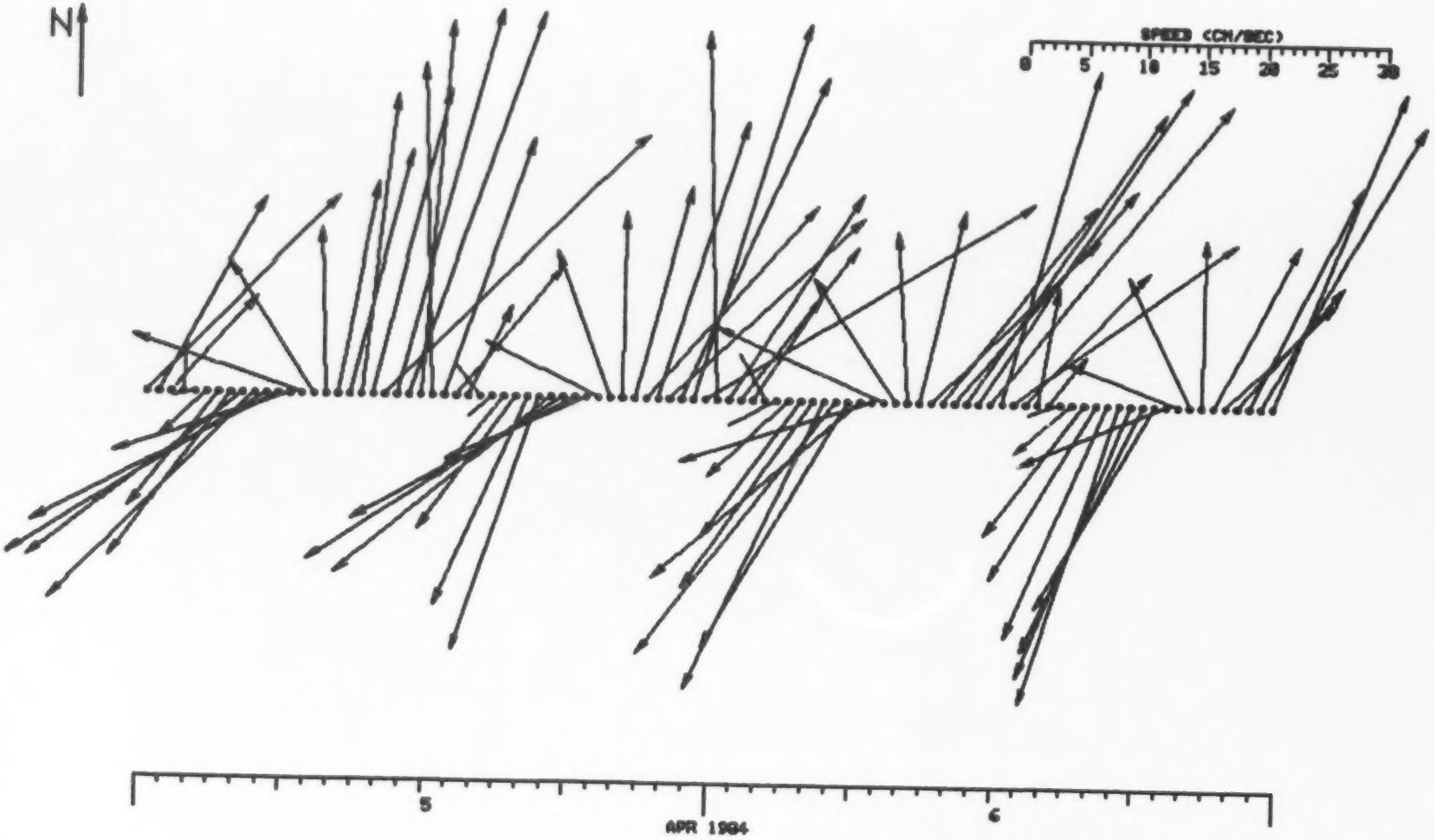
FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 31.6'N 78 29.8'W

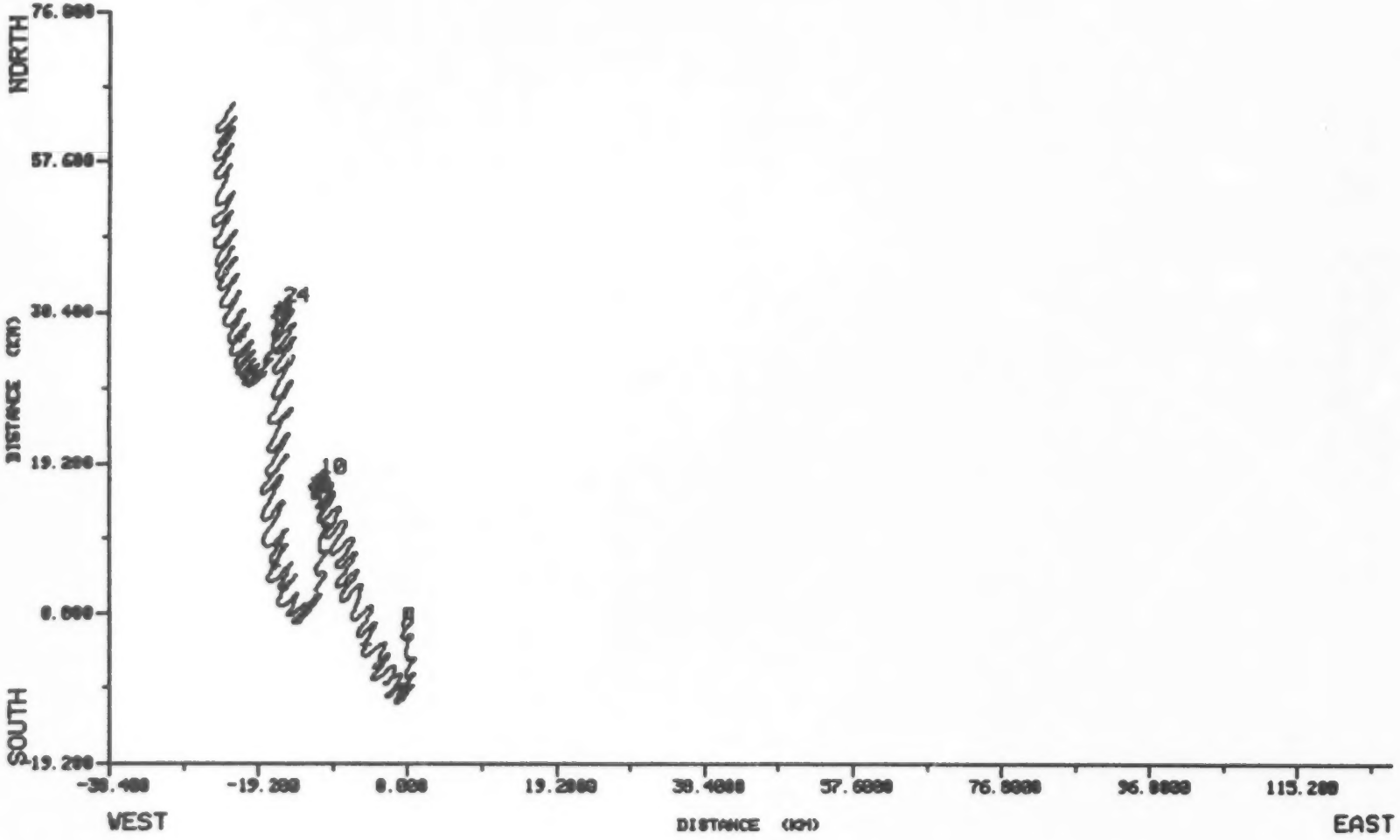


FOXE BASIN TIDAL SURVEY, 1984

SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W

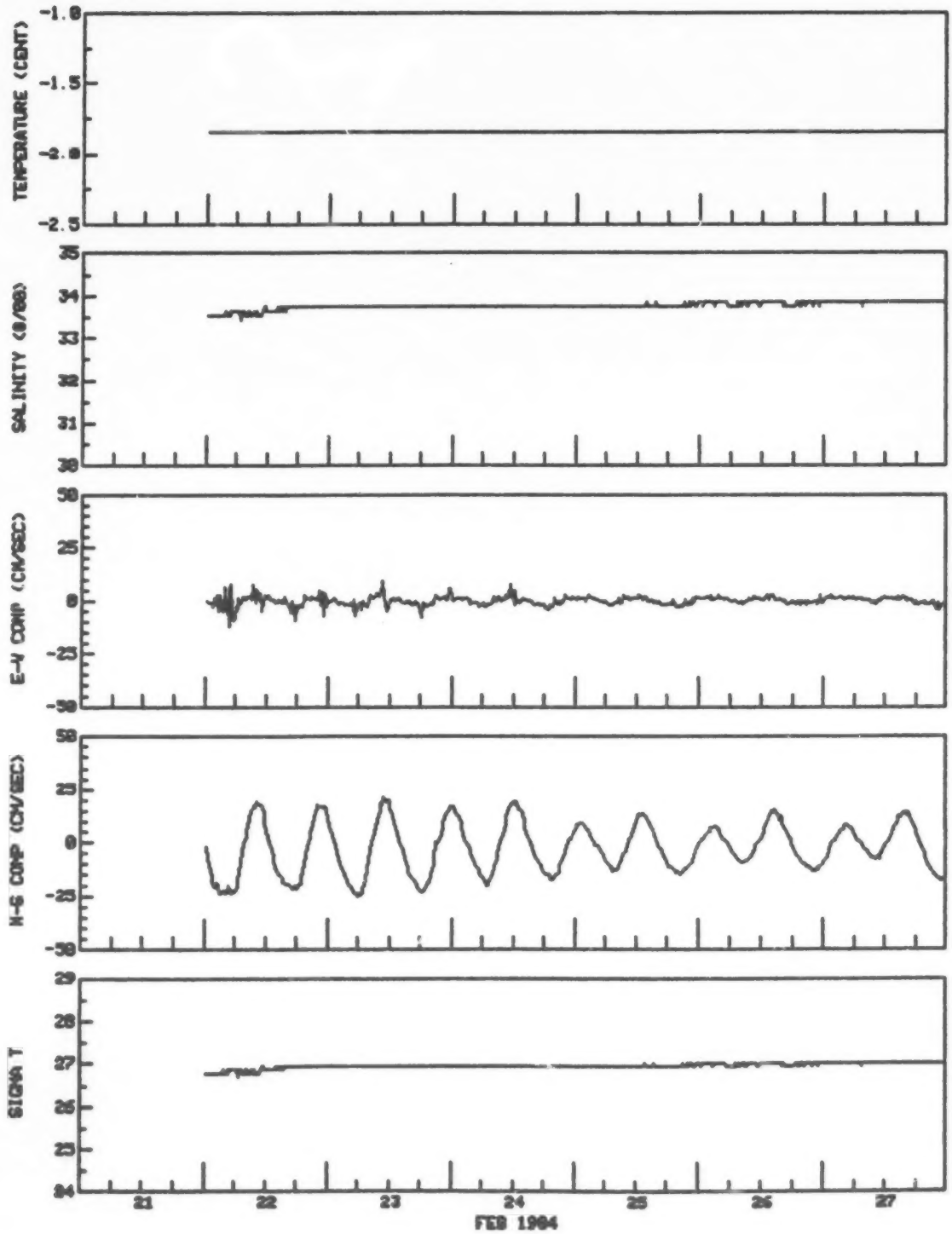


PROGRESSIVE VECTOR DIAGRAM
FOXE BASIN SITE #1 METER 2775/17 DEPTH(m) 6 TYPE DESPIKED
69 52'N 78 30'W AANDERAA DT(min) 15
TIME INTERVAL 25/02/84 - 7/04/84 LABELS ARE ELAPSED DAYS



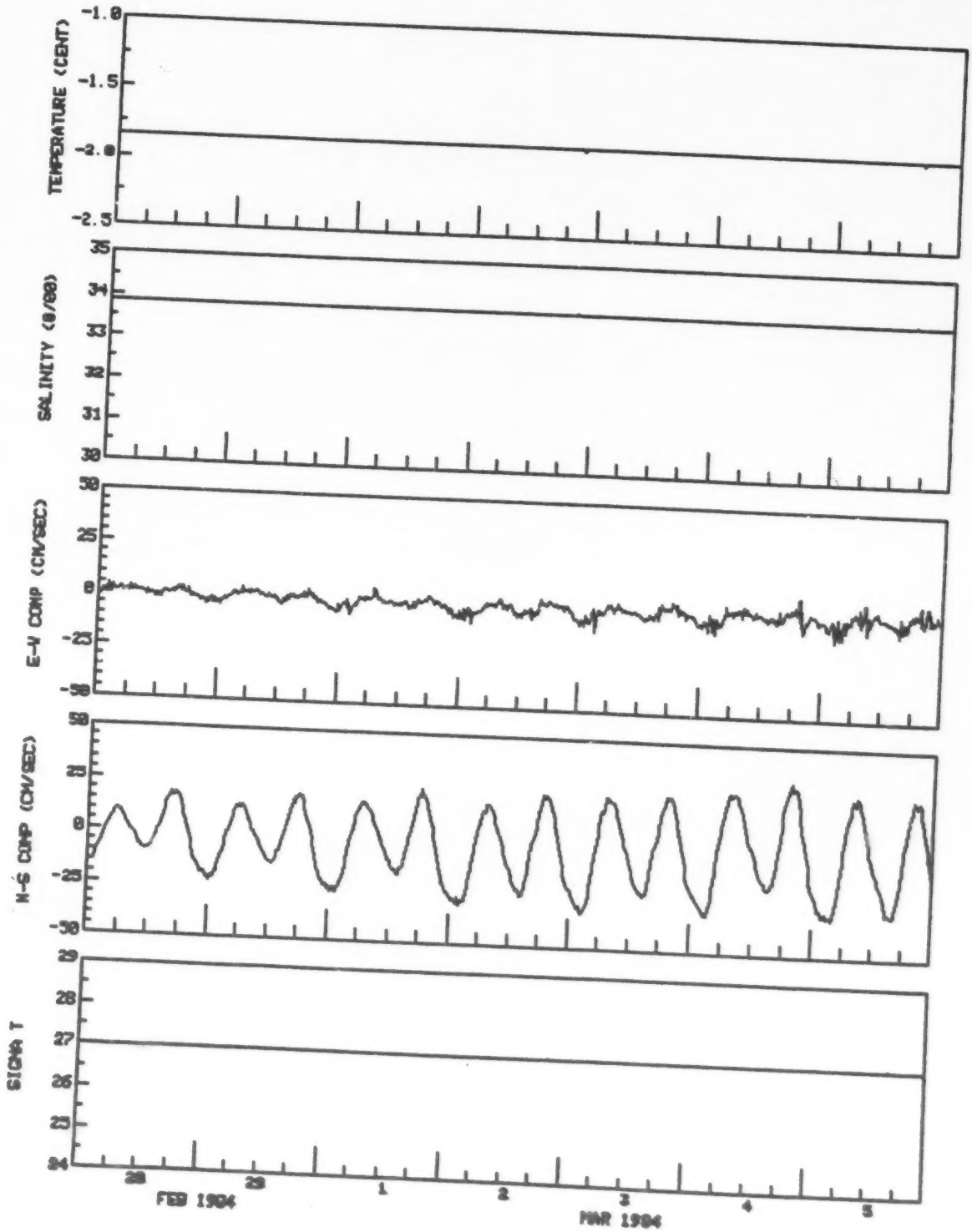
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



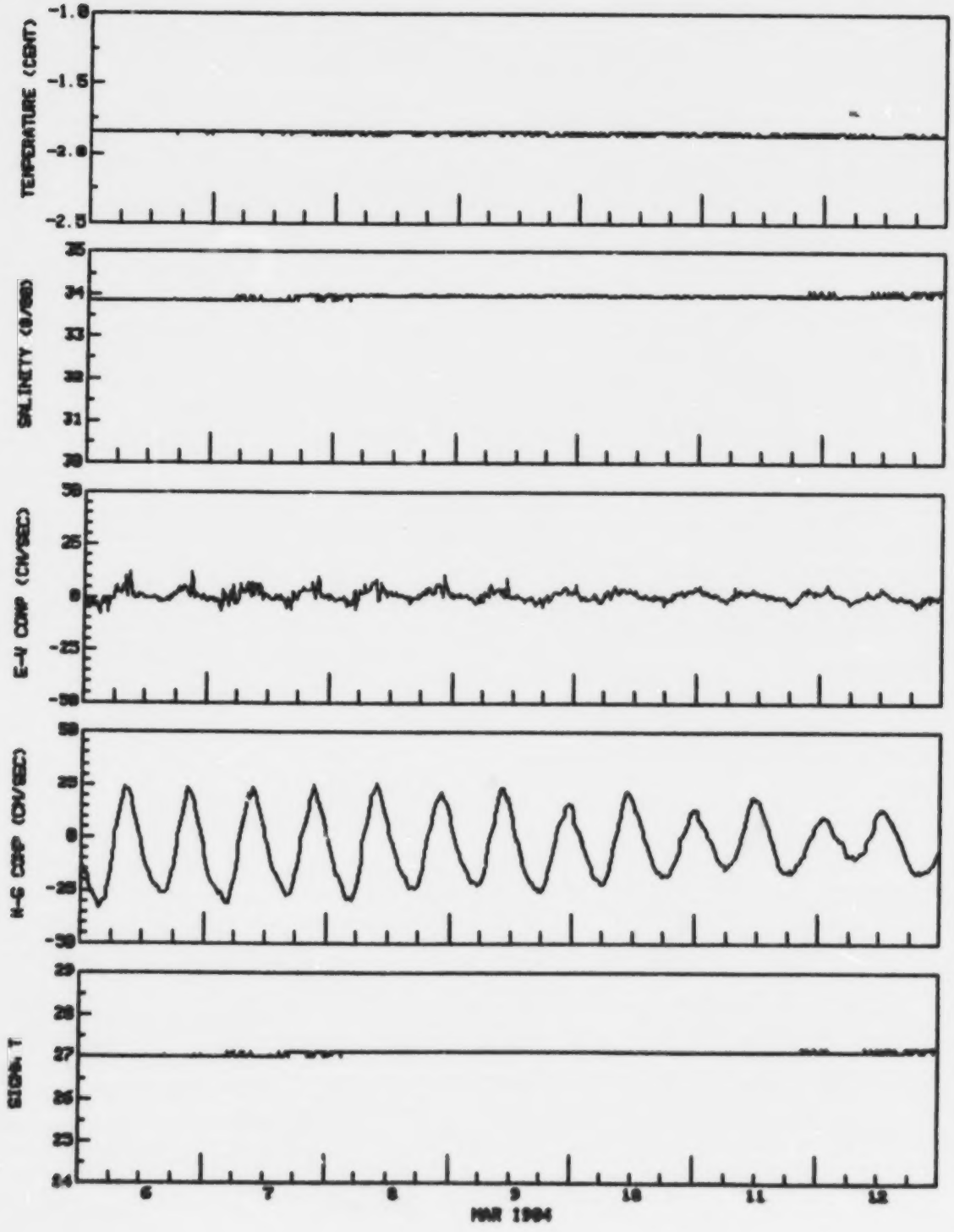
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



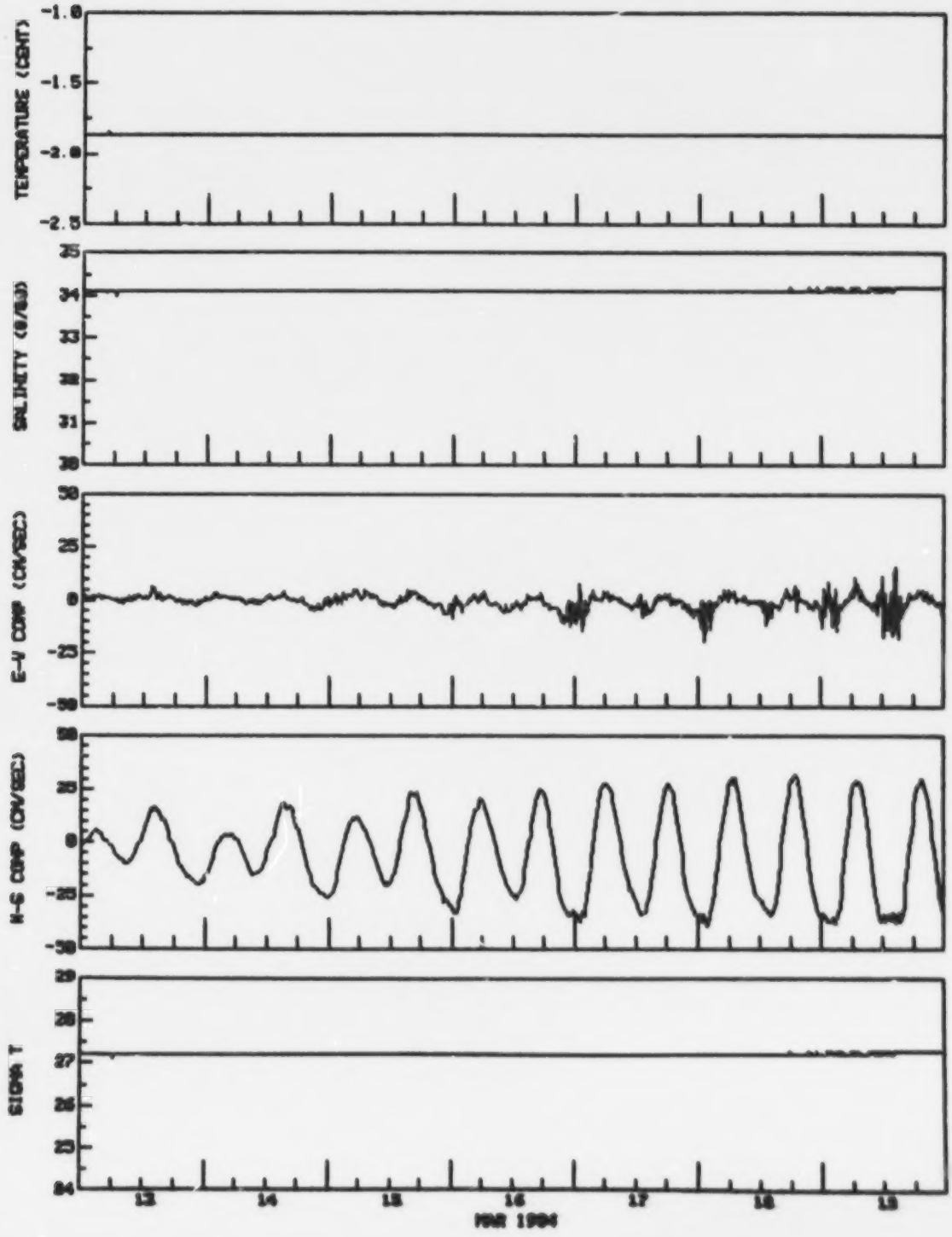
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



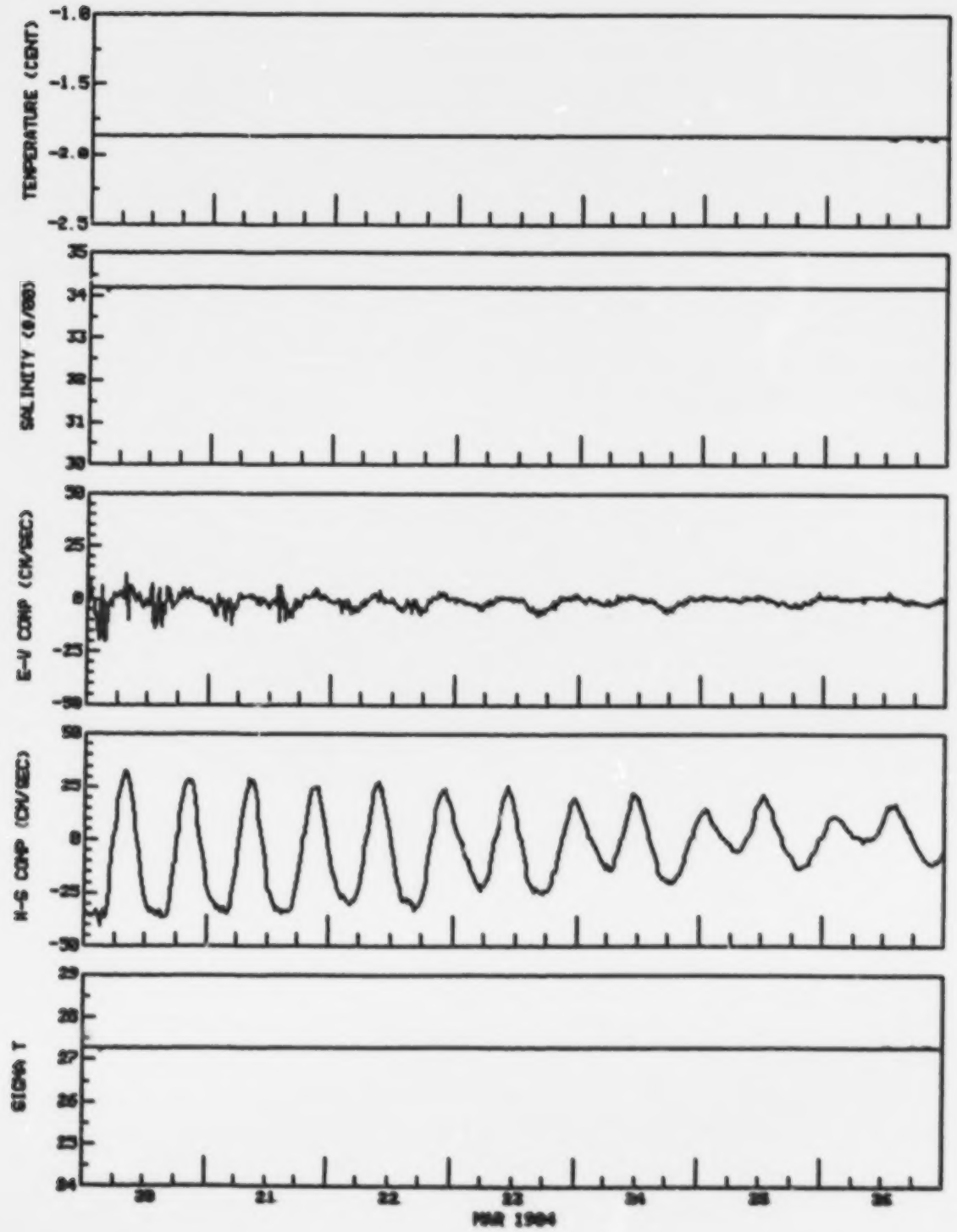
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



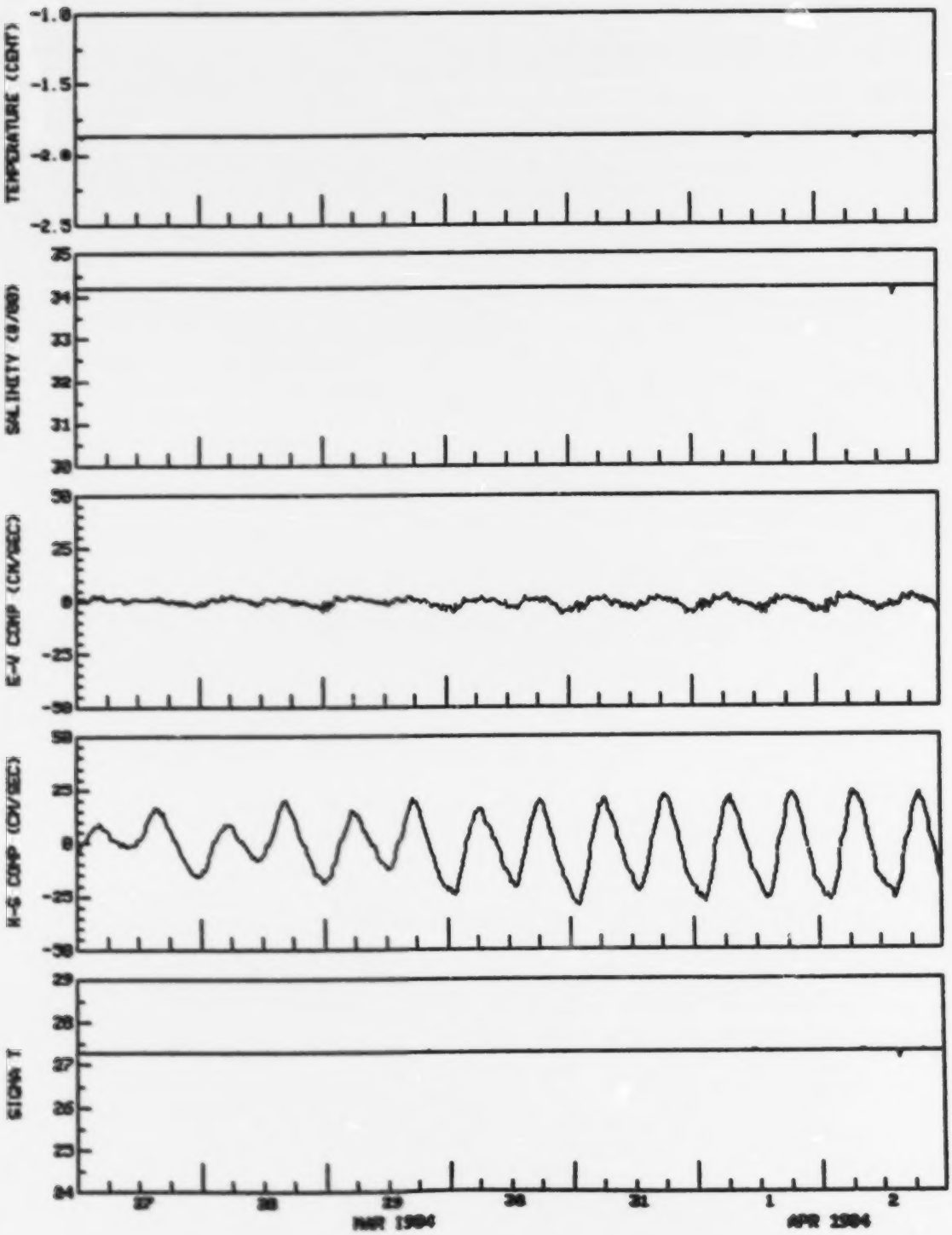
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



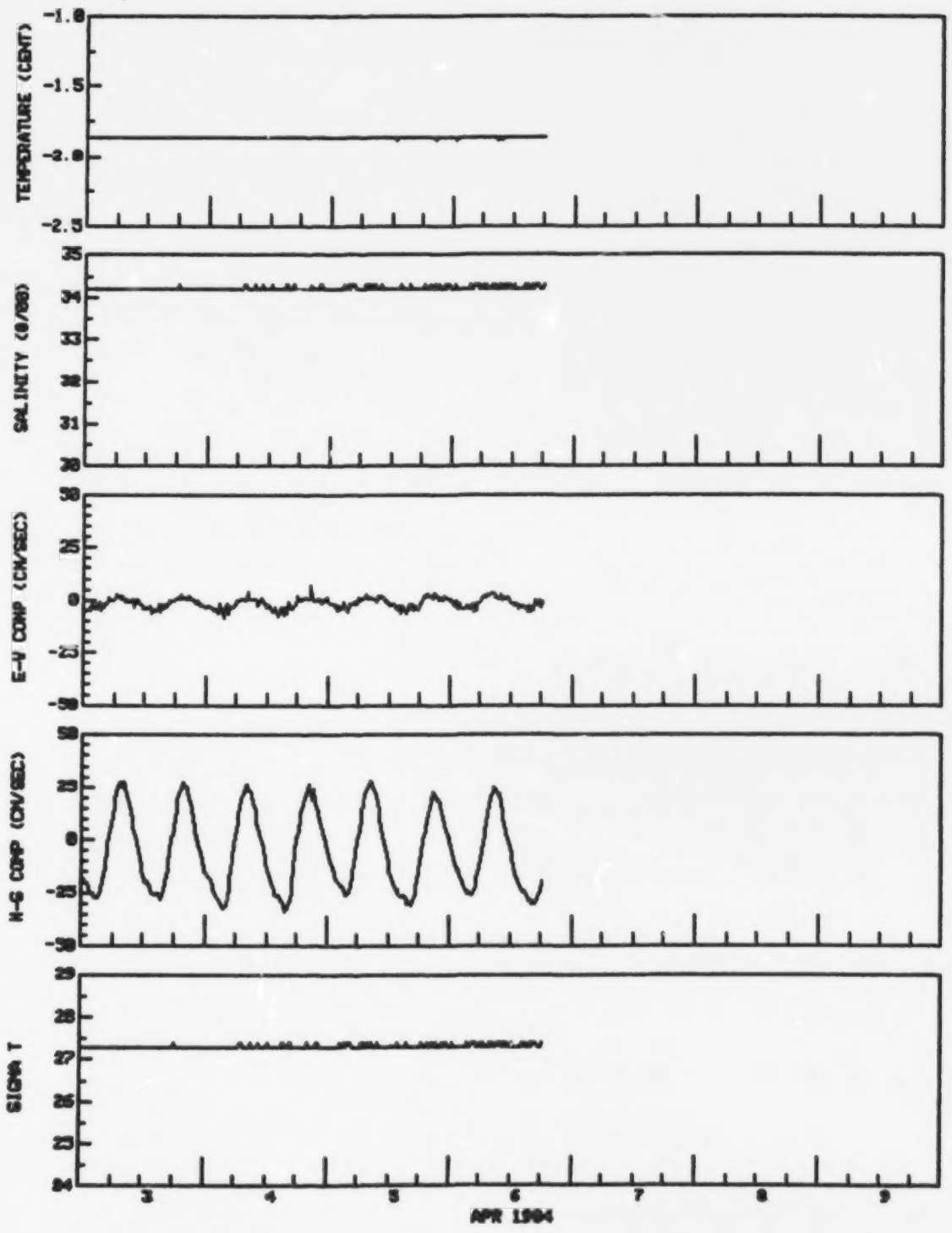
FOXE BASIN TIDAL SURVEY, 1984

SITE 88 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W



FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA CM 2772 DEPTH(m) 6 67 6.3'N 81 22.9'W

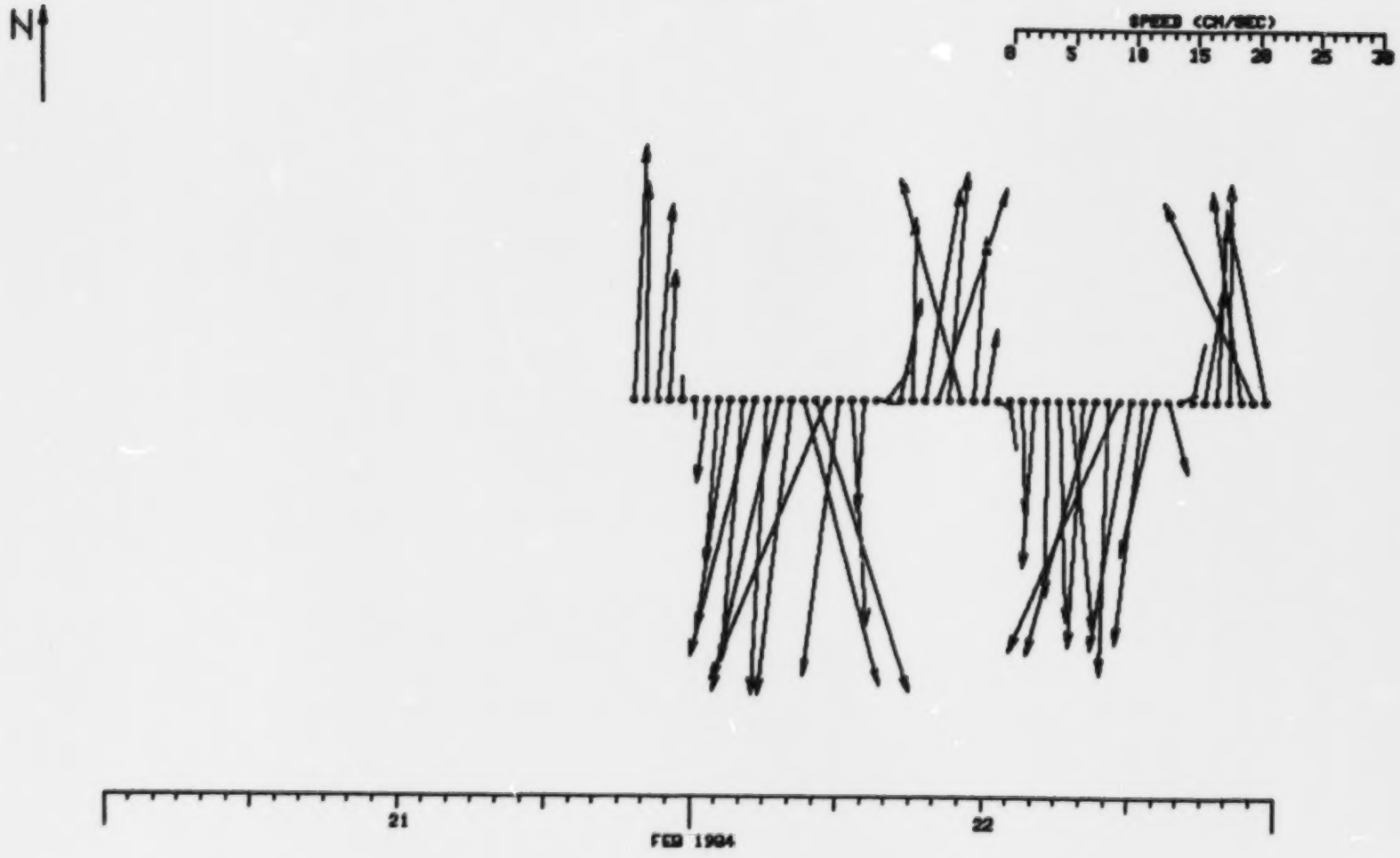


Site: FOXE BASIN Site #8
Latitude: 67 6'N Longitude: 81 23'W
Meter: 2772/20
Depth: 6 m
Sample interval 15 min.
Sample Period: 21/2/84 - 6/4/84

DIRECTION (DEG)	SPEED (CM/SEC) 0.0 to 5.0	5.0 to 10.0	10.0 to 15.0	15.0 to 20.0	20.0 to 25.0	25.0 to 30.0	30.0 to 35.0	35.0 to 40.0	40.0 to 45.0	45.0 to 50.0	
0.0 to 15.0	98	213	256	261	167	73	10				1078
15.0 to 30.0	106	81	35	24	16	4	2				268
30.0 to 45.0	65	12	3								80
45.0 to 60.0	56	1									57
60.0 to 75.0	43										43
75.0 to 90.0	42										42
90.0 to 105.0	24										24
105.0 to 120.0	27	3									30
120.0 to 135.0	21	4									25
135.0 to 150.0	15	6									21
150.0 to 165.0	44	26	4		2			3			79
165.0 to 180.0	44	70	58	37	23	13	12	14			271
180.0 to 195.0	82	210	255	301	385	245	116	30	1		1565
195.0 to 210.0	58	81	41	43	24	9	22	27			297
210.0 to 225.0	27	7			1			1			36
225.0 to 240.0	7										7
240.0 to 255.0	2										2
255.0 to 270.0	2										2
270.0 to 285.0	6										6
285.0 to 300.0	2										2
300.0 to 315.0	6										6
315.0 to 330.0	11	2									13
330.0 to 345.0	26	17	3	2		1	2				51
345.0 to 360.0	36	71	61	63	33	13	5				282
	848	884	756	731	571	359	169	75	1	0	4313

FOXE BASIN TIDAL SURVEY, 1984

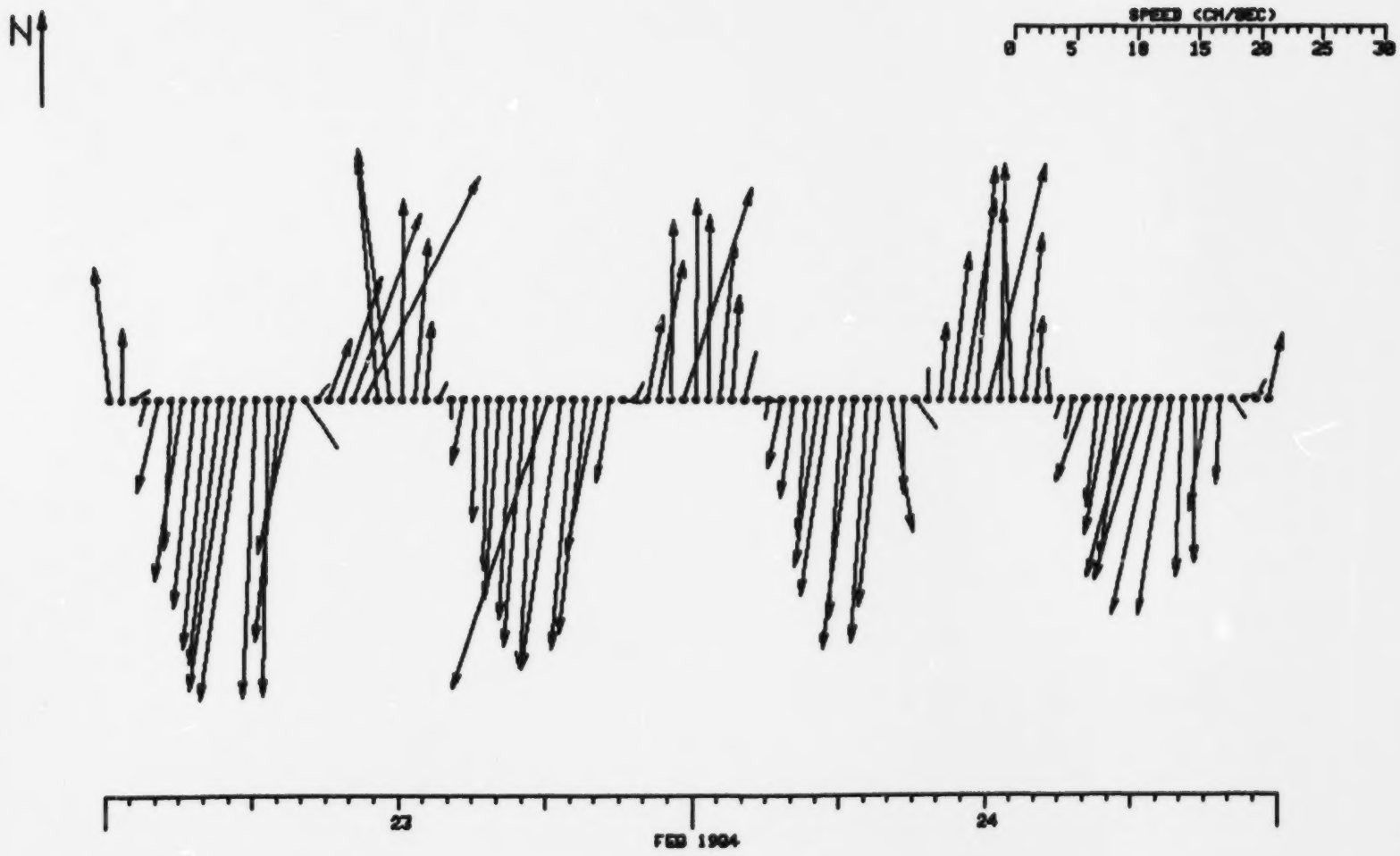
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



94

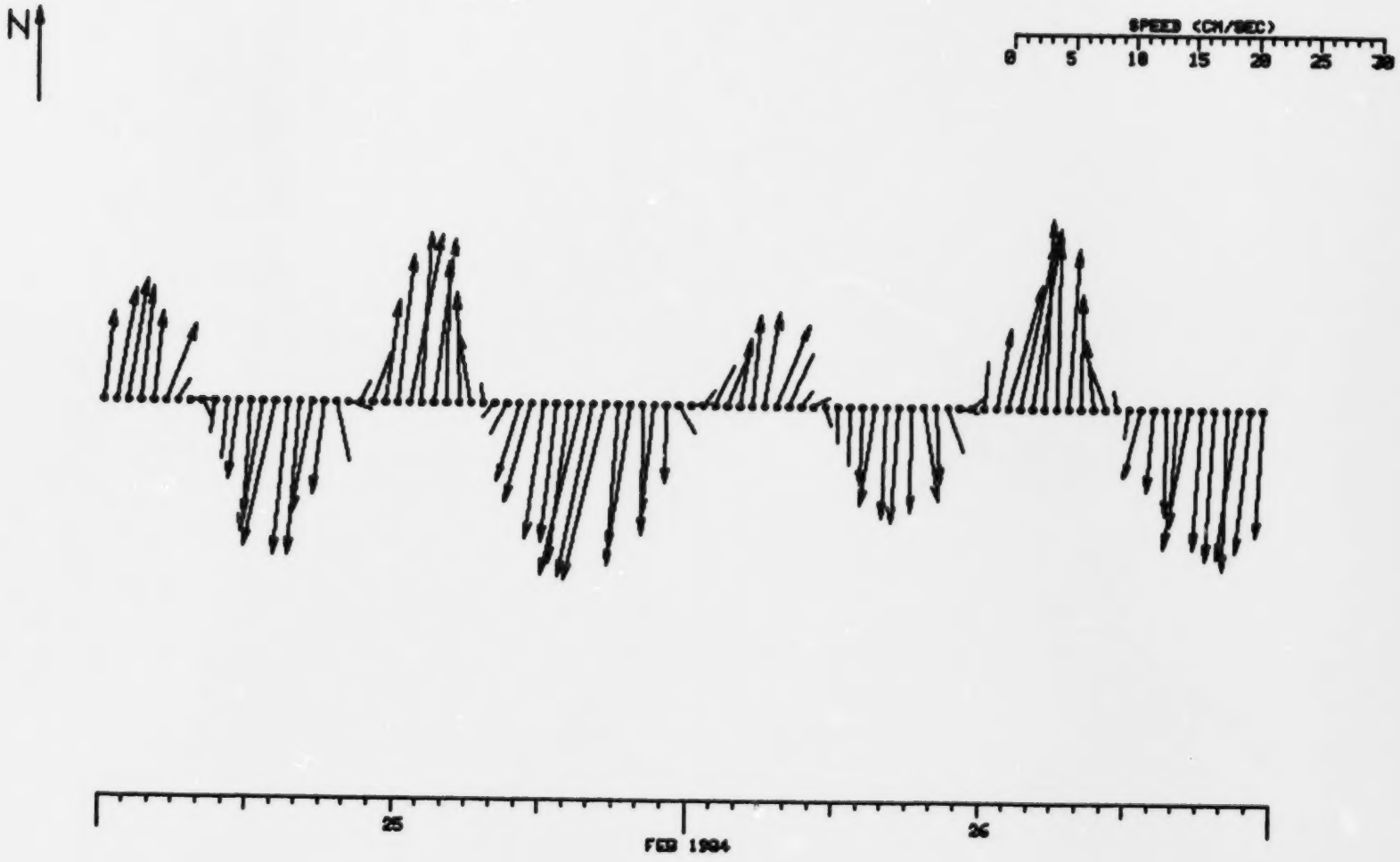
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



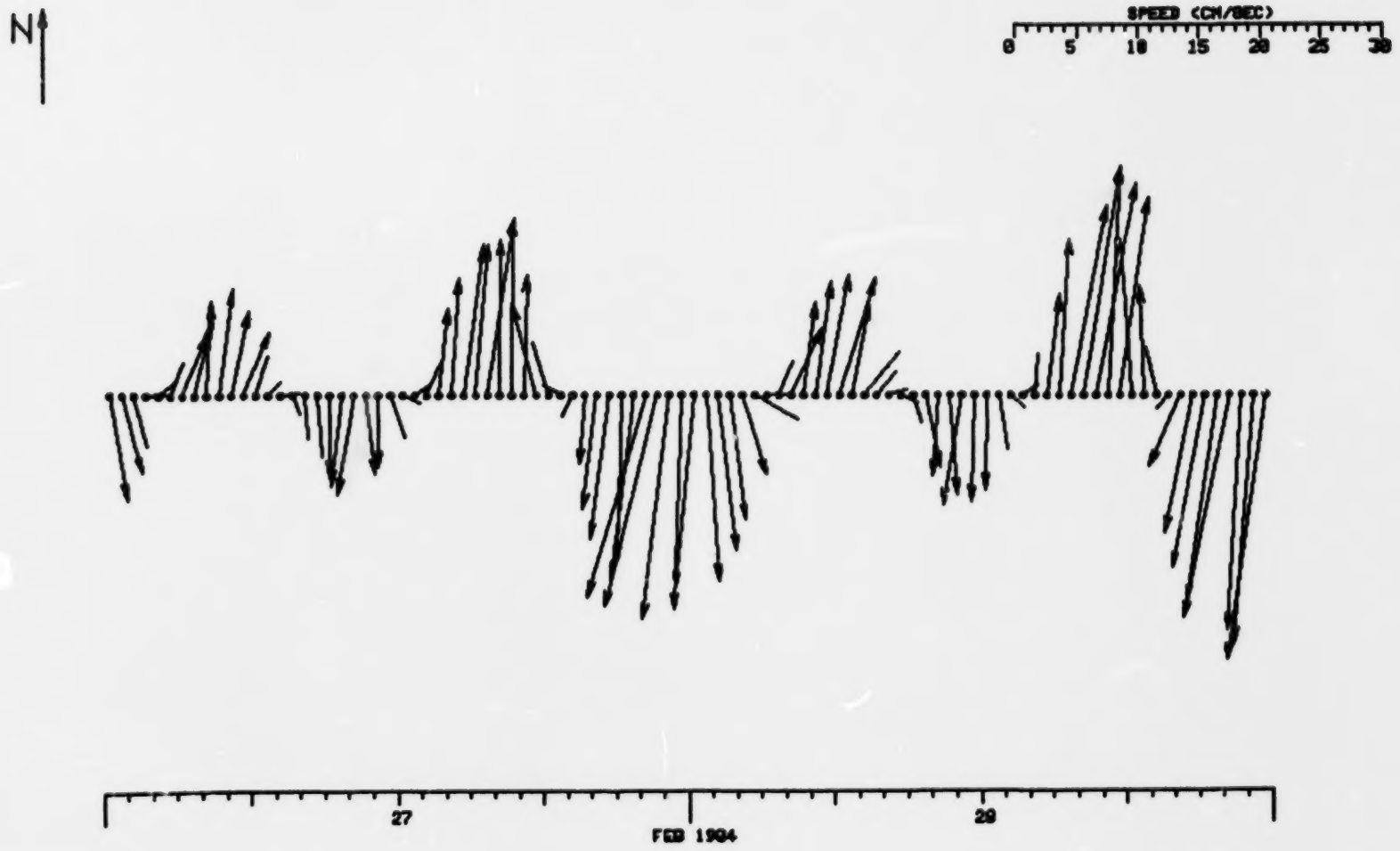
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



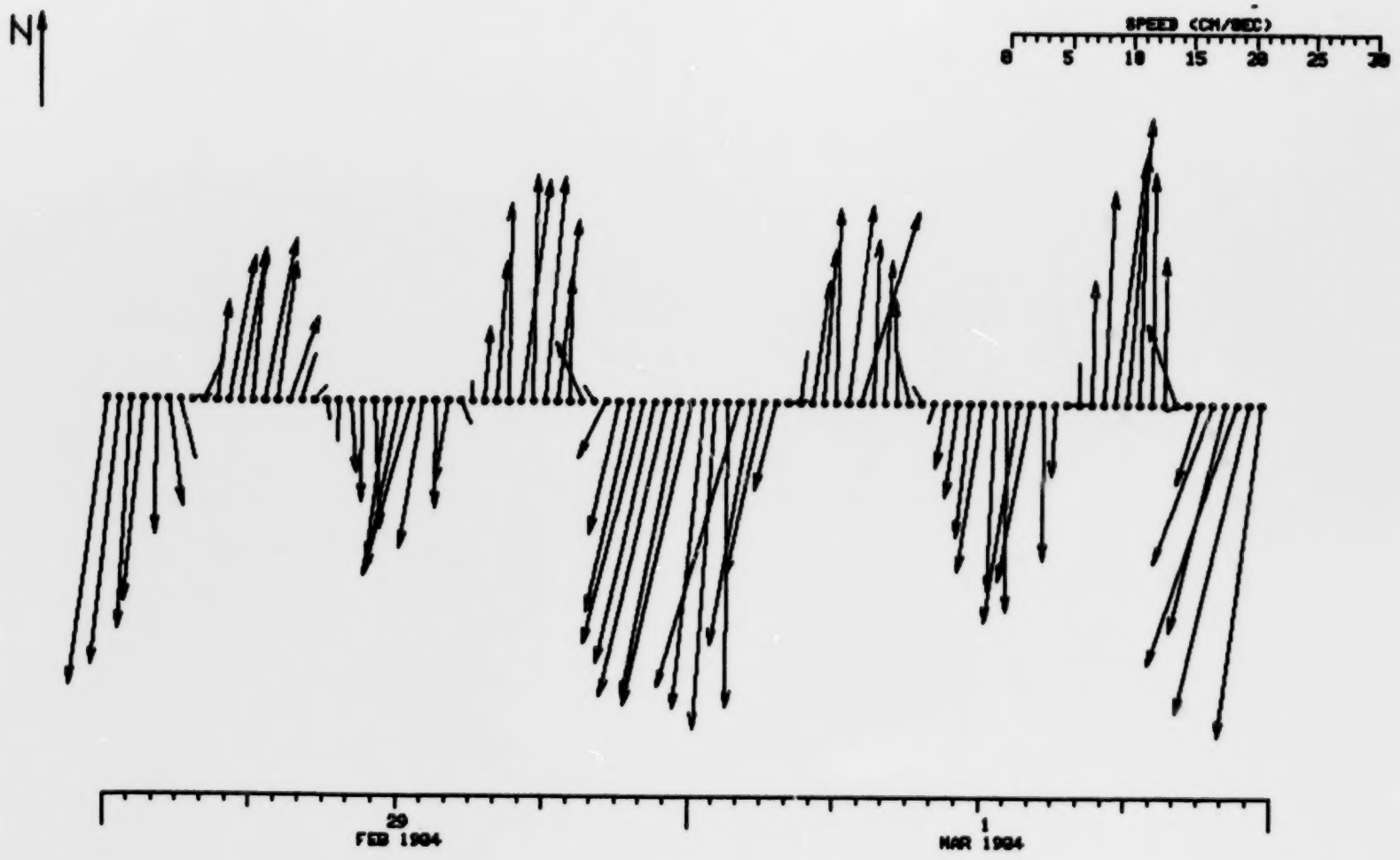
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



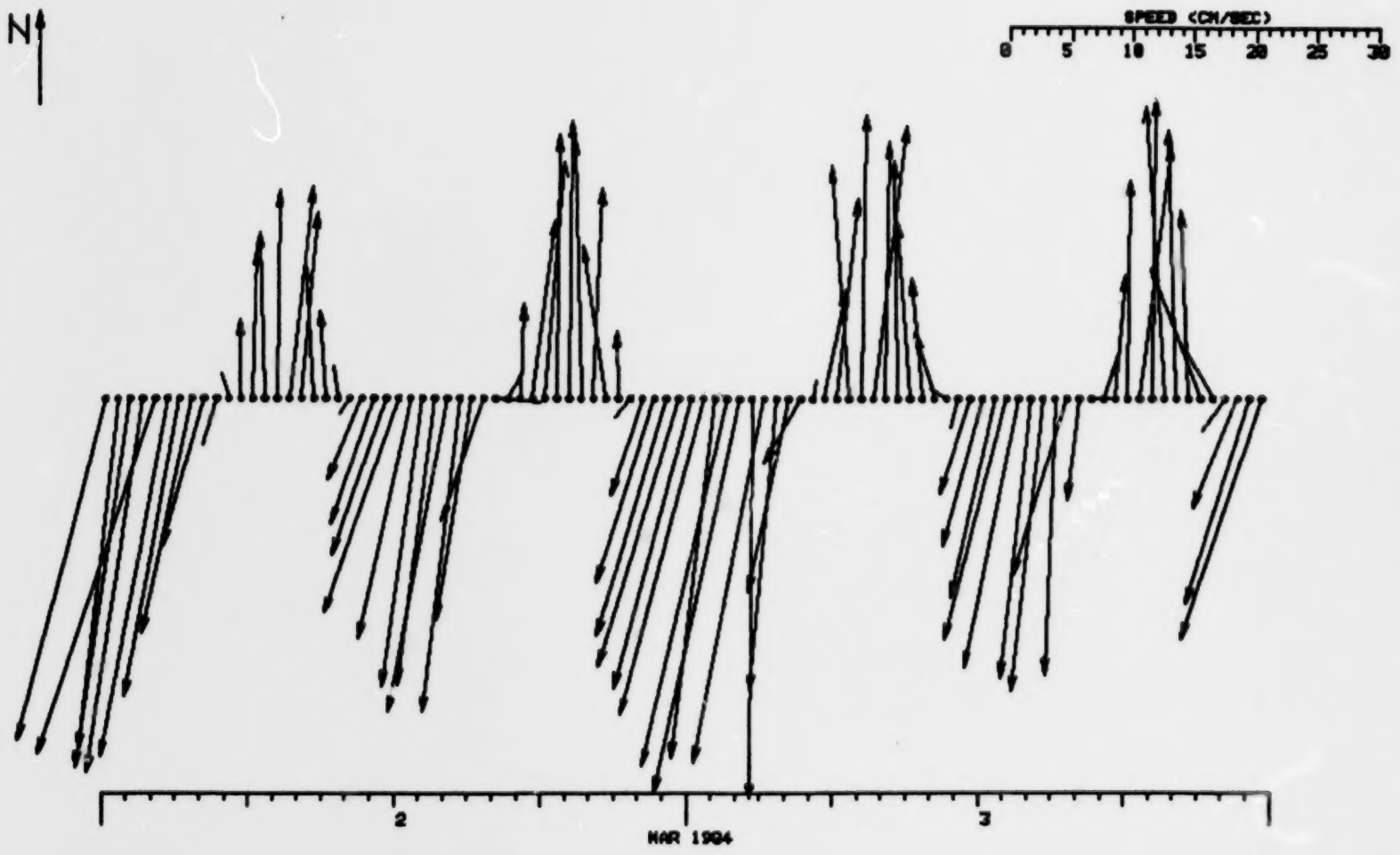
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



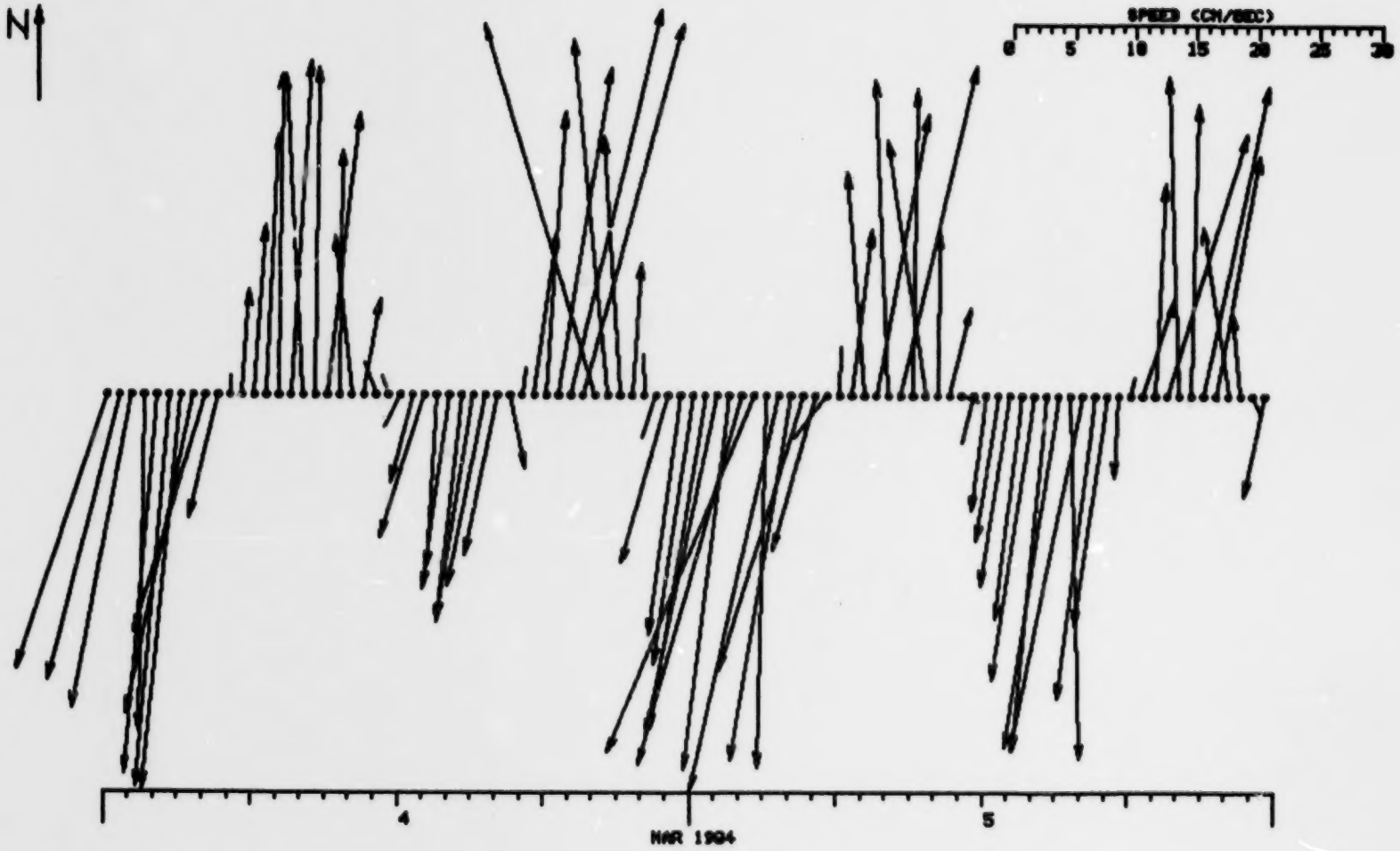
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



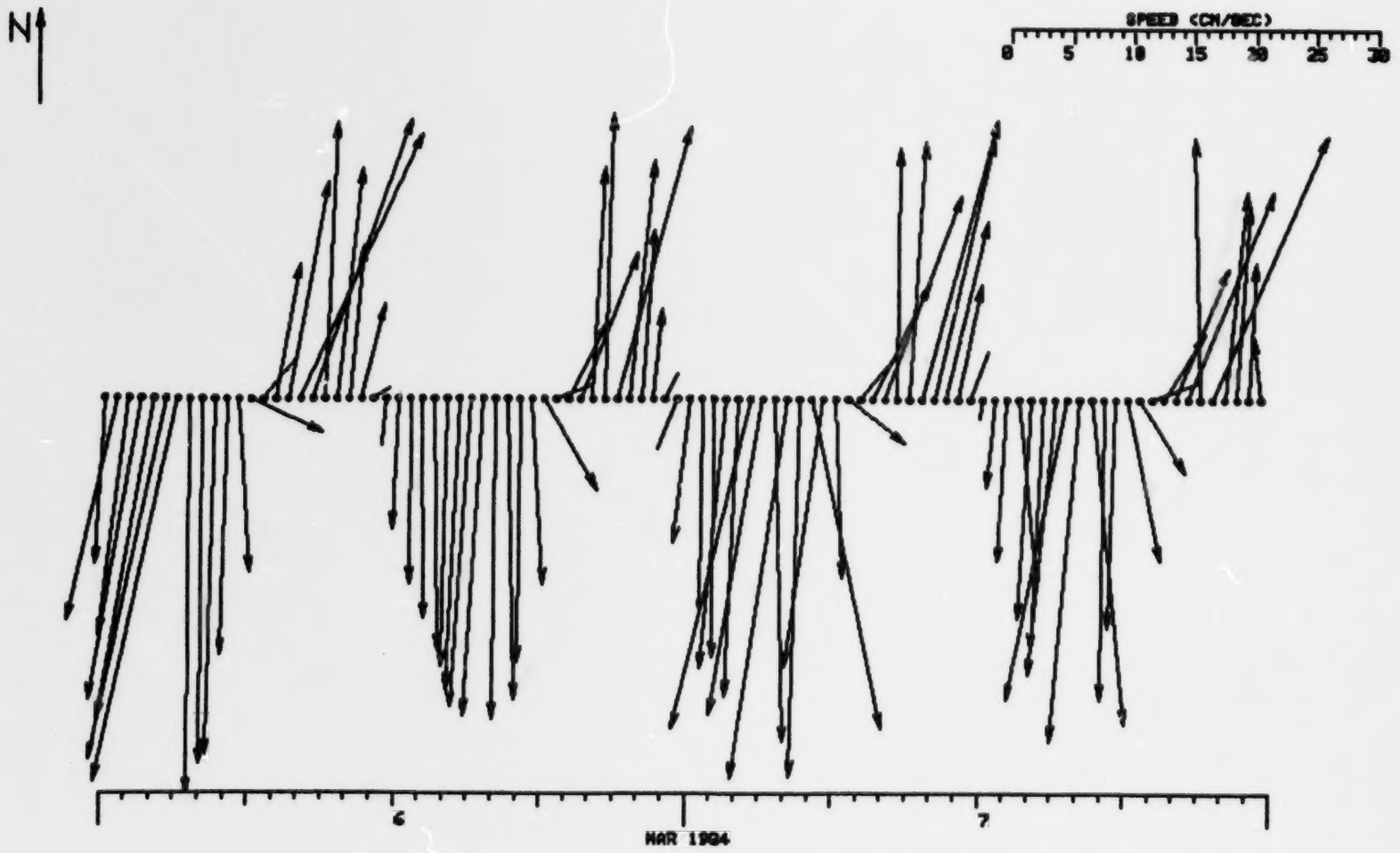
FOXE BASIN TIDAL SURVEY, 1984

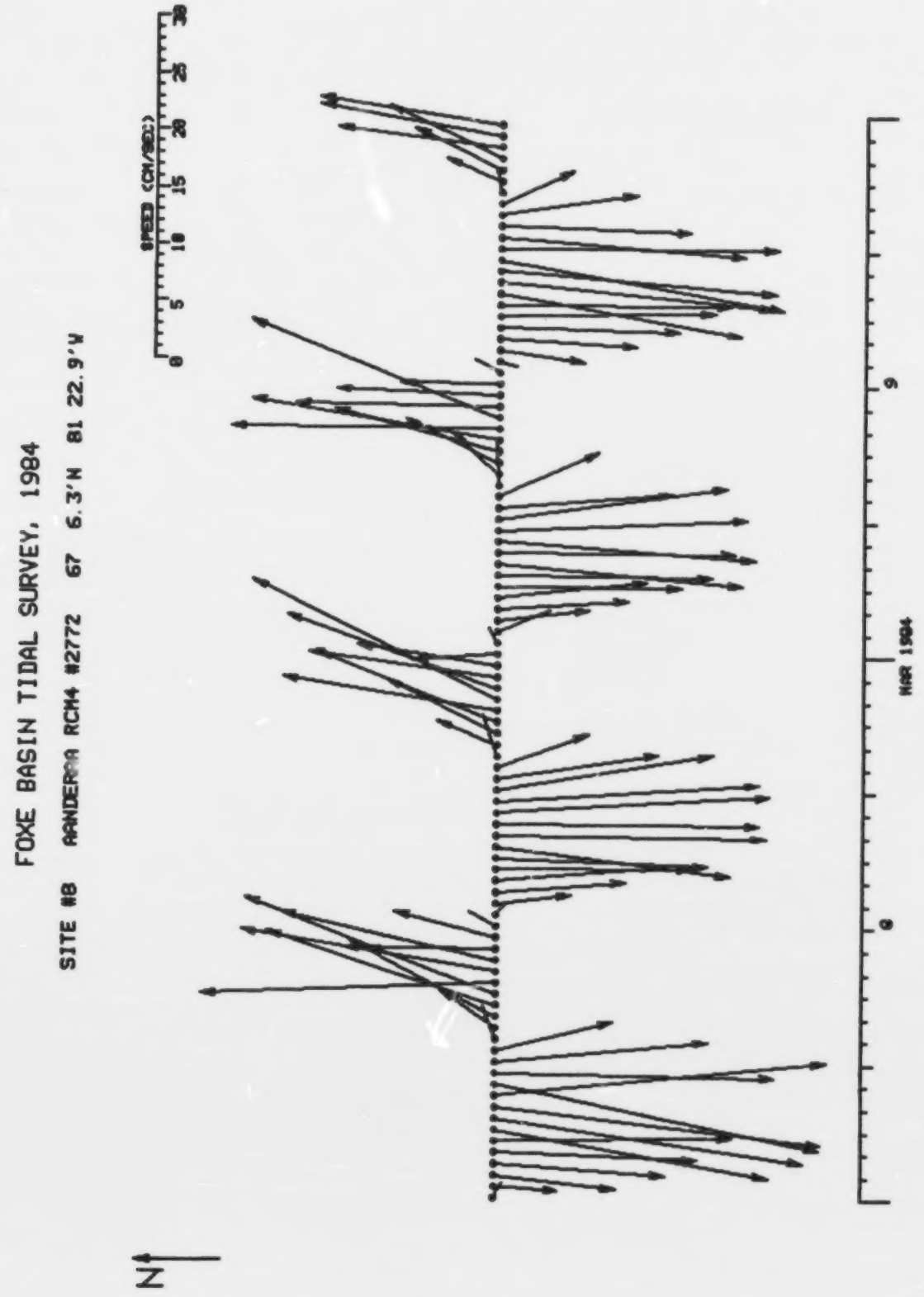
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



FOXE BASIN TIDAL SURVEY, 1984

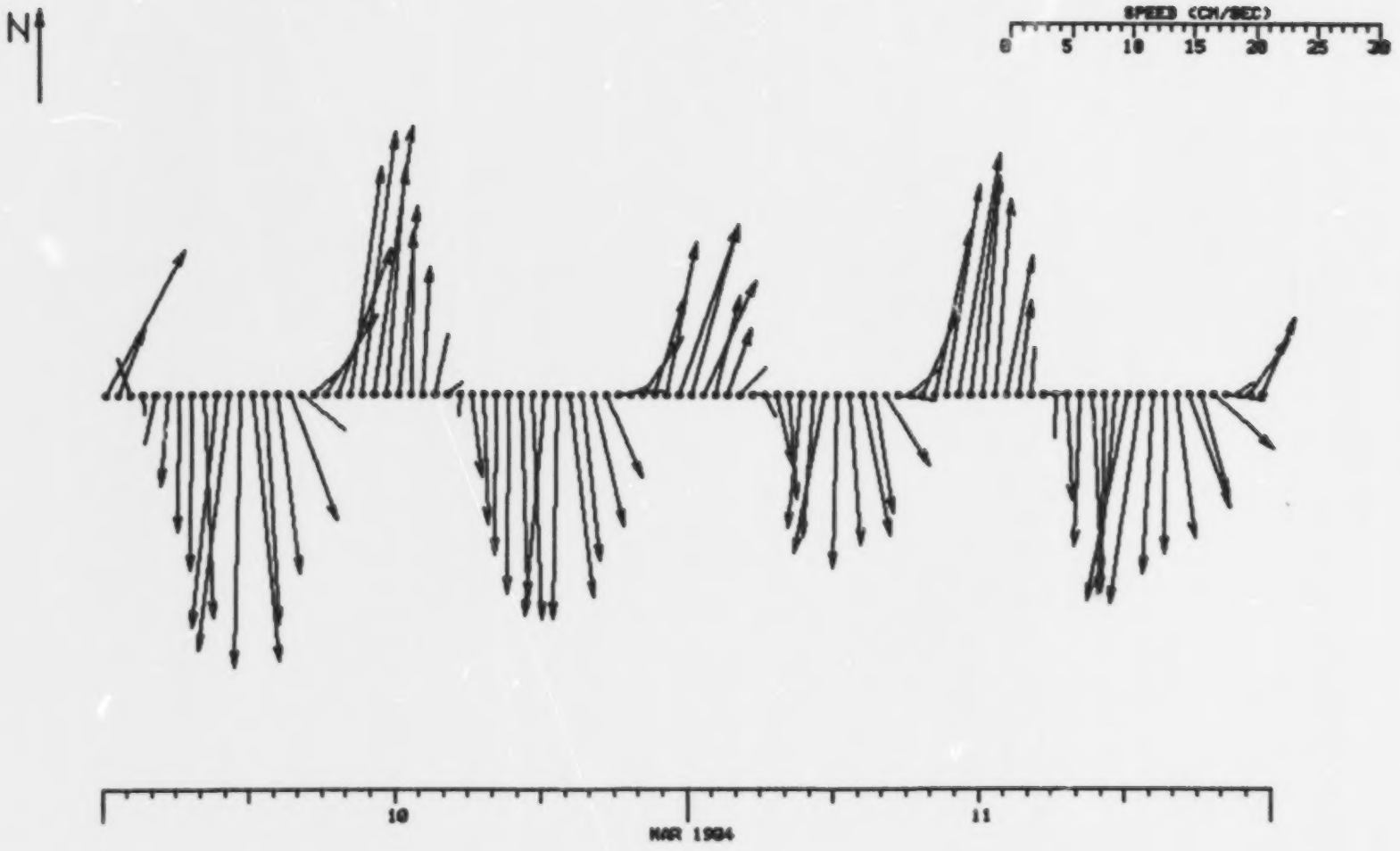
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W




FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
9
MAR 1984
N

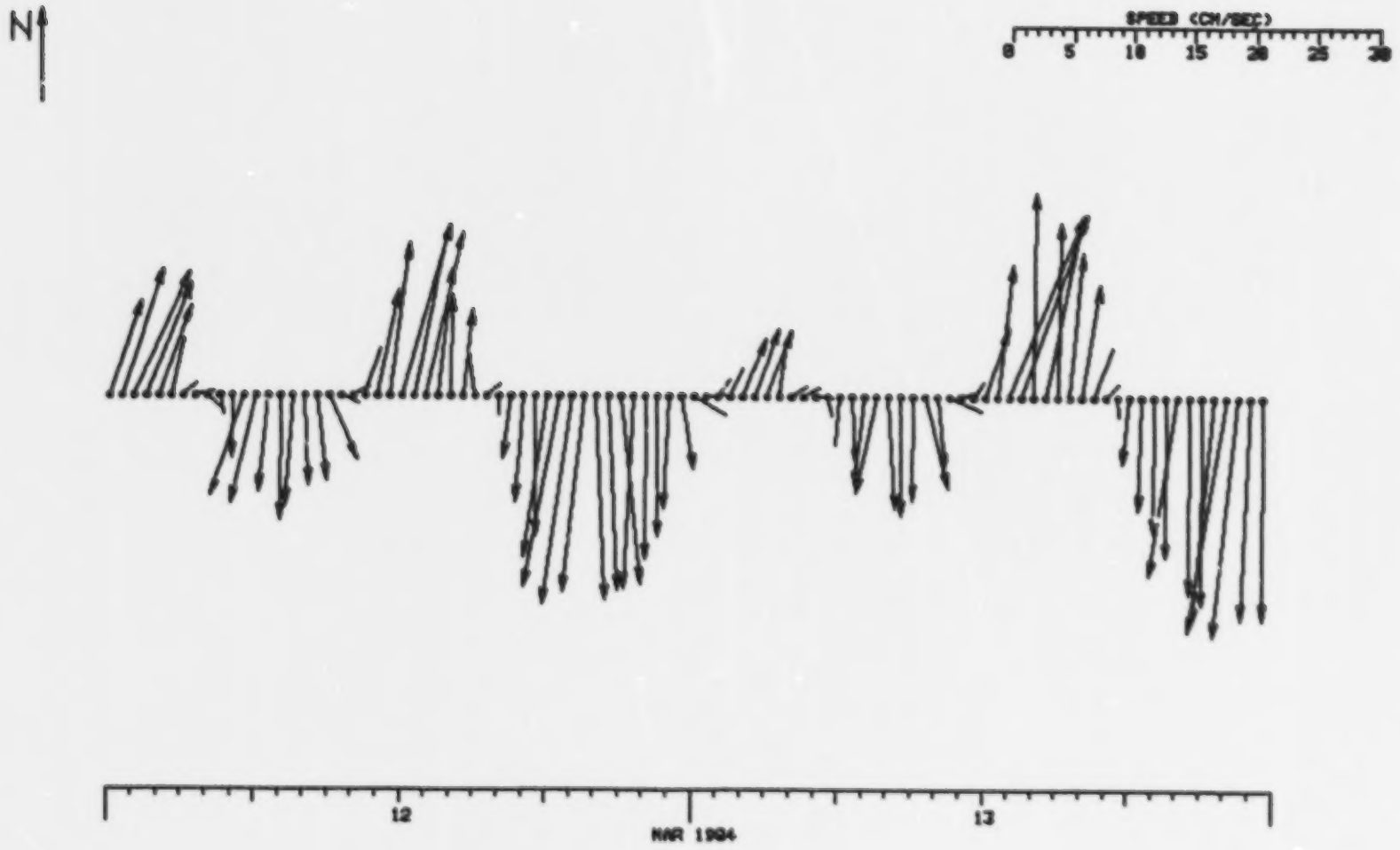
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



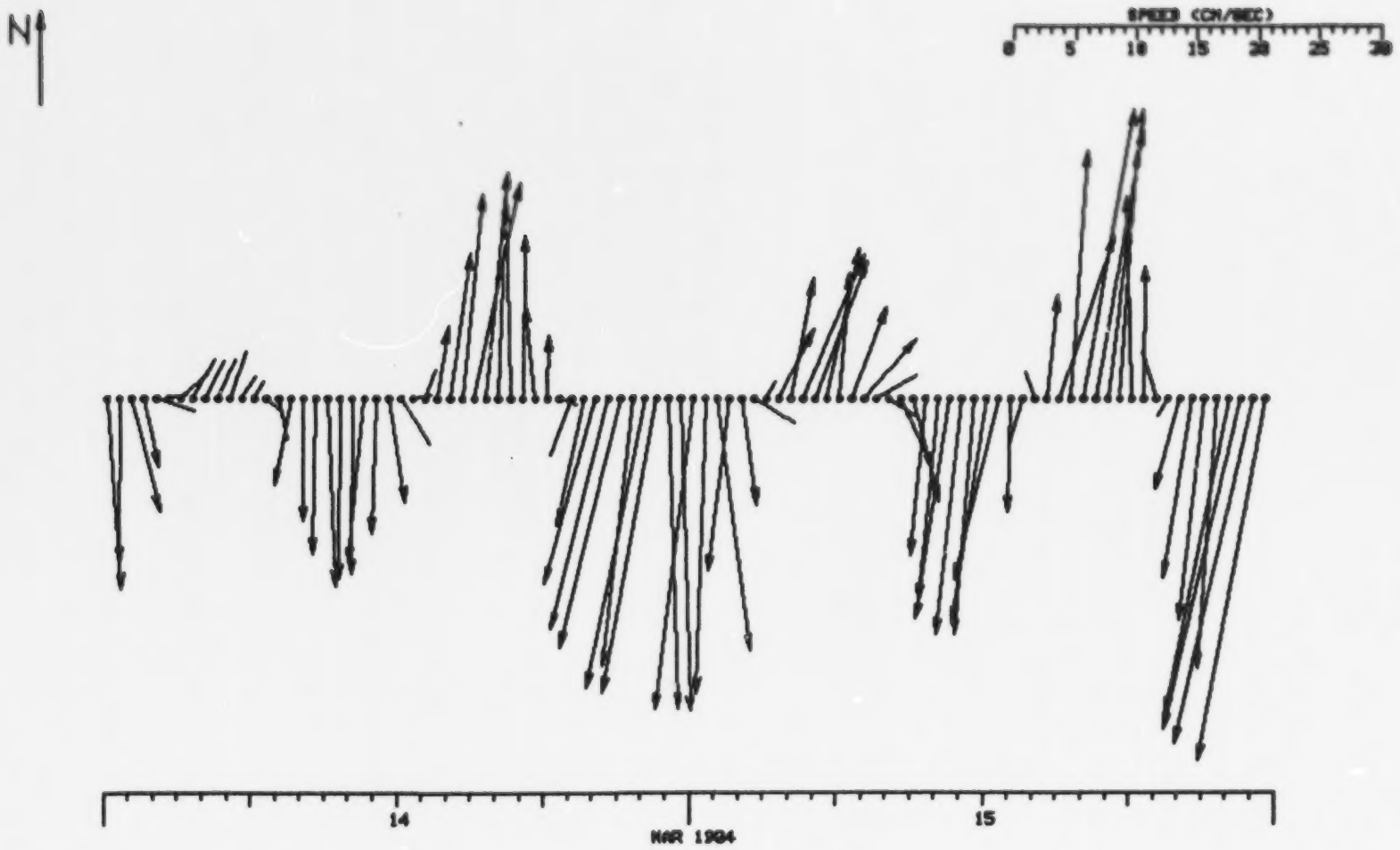
FOXE BASIN TIDAL SURVEY, 1984

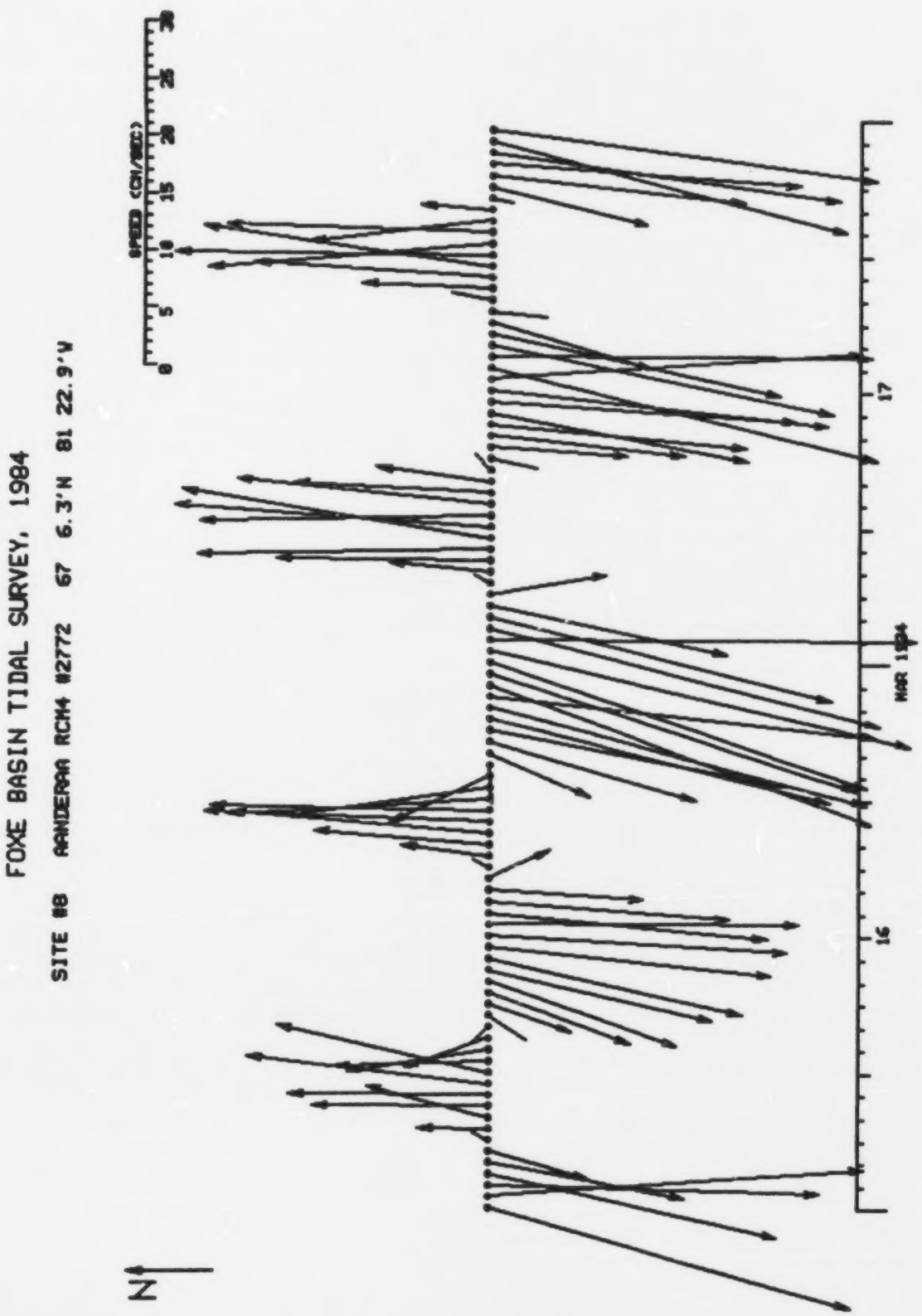
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W

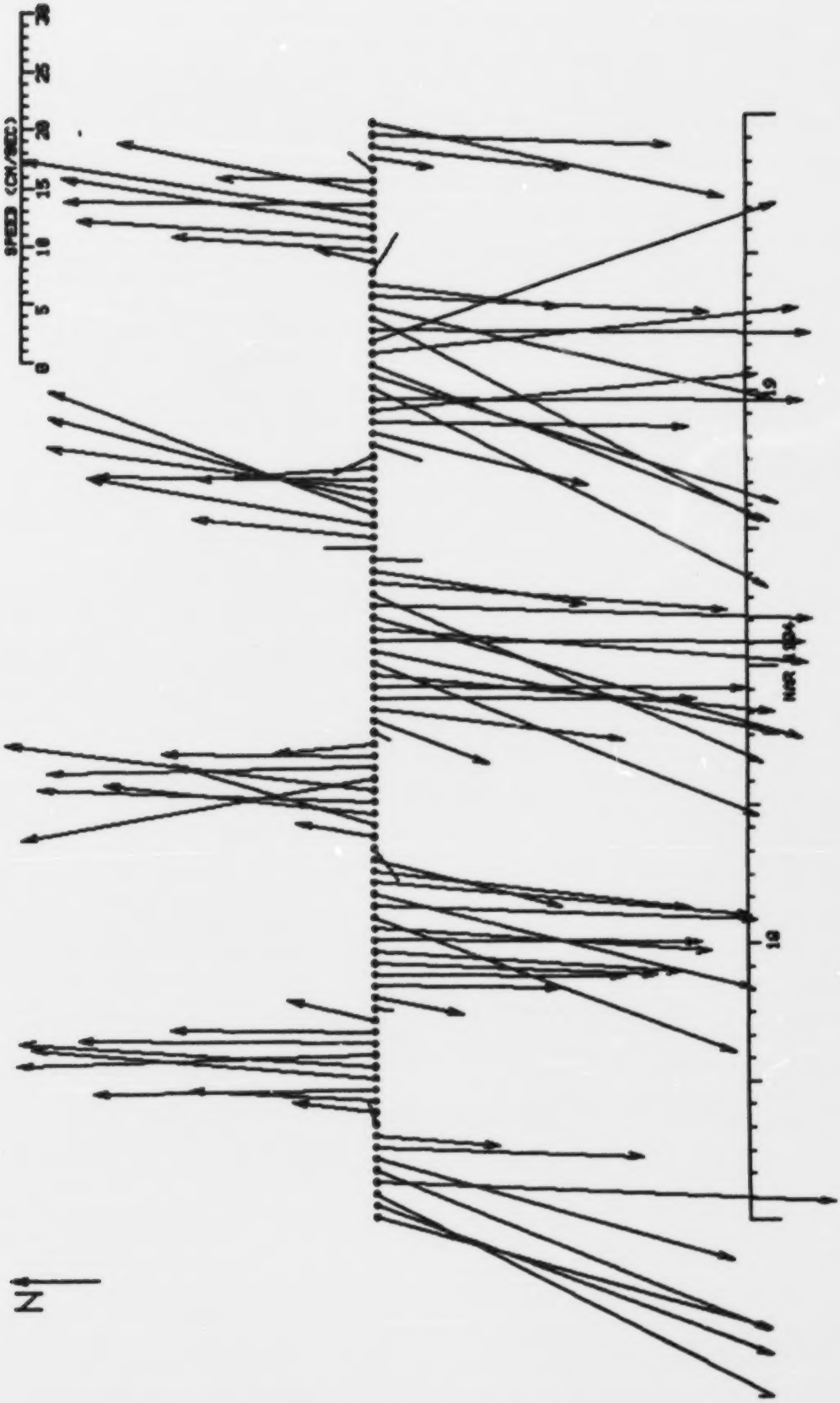


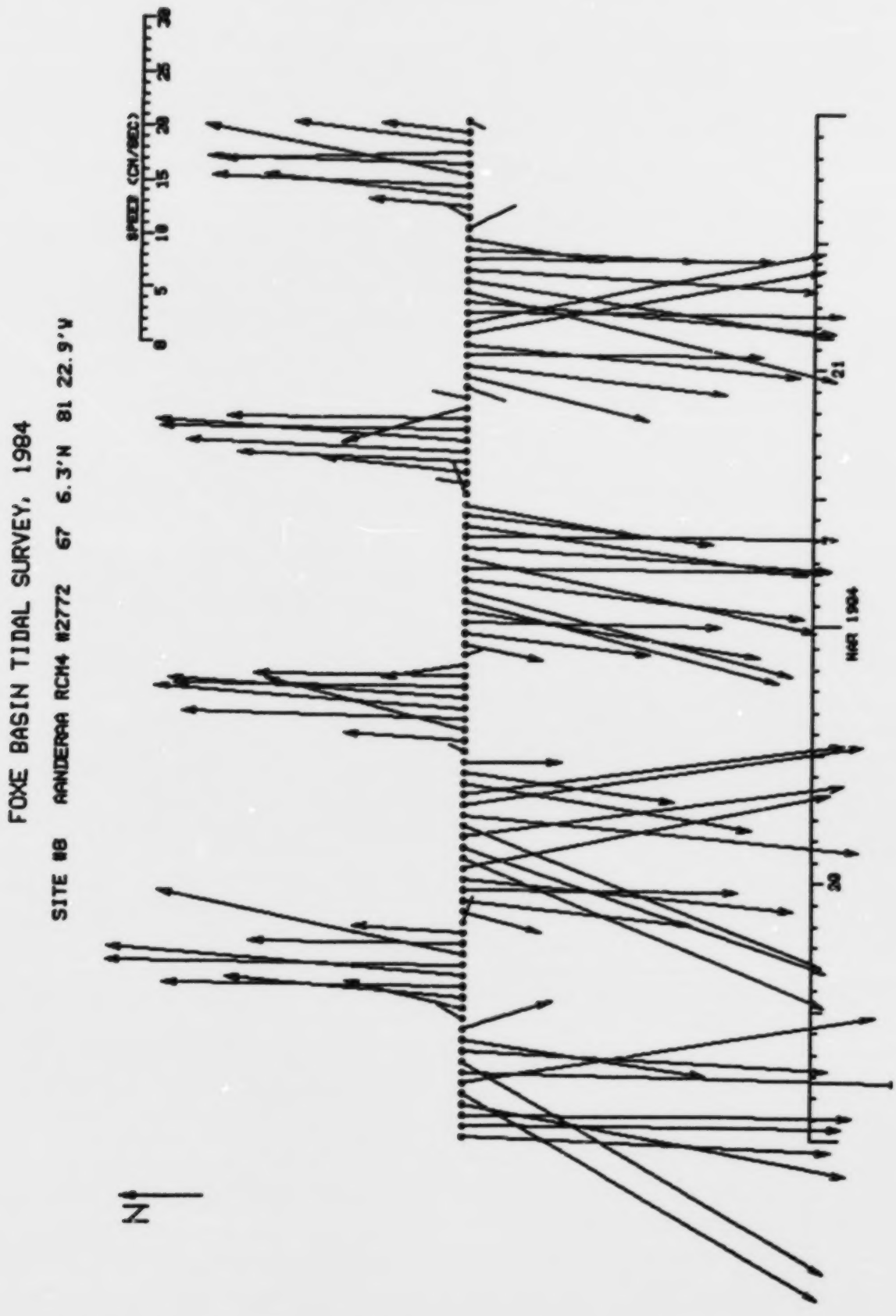
FOXE BASIN TIDAL SURVEY, 1984

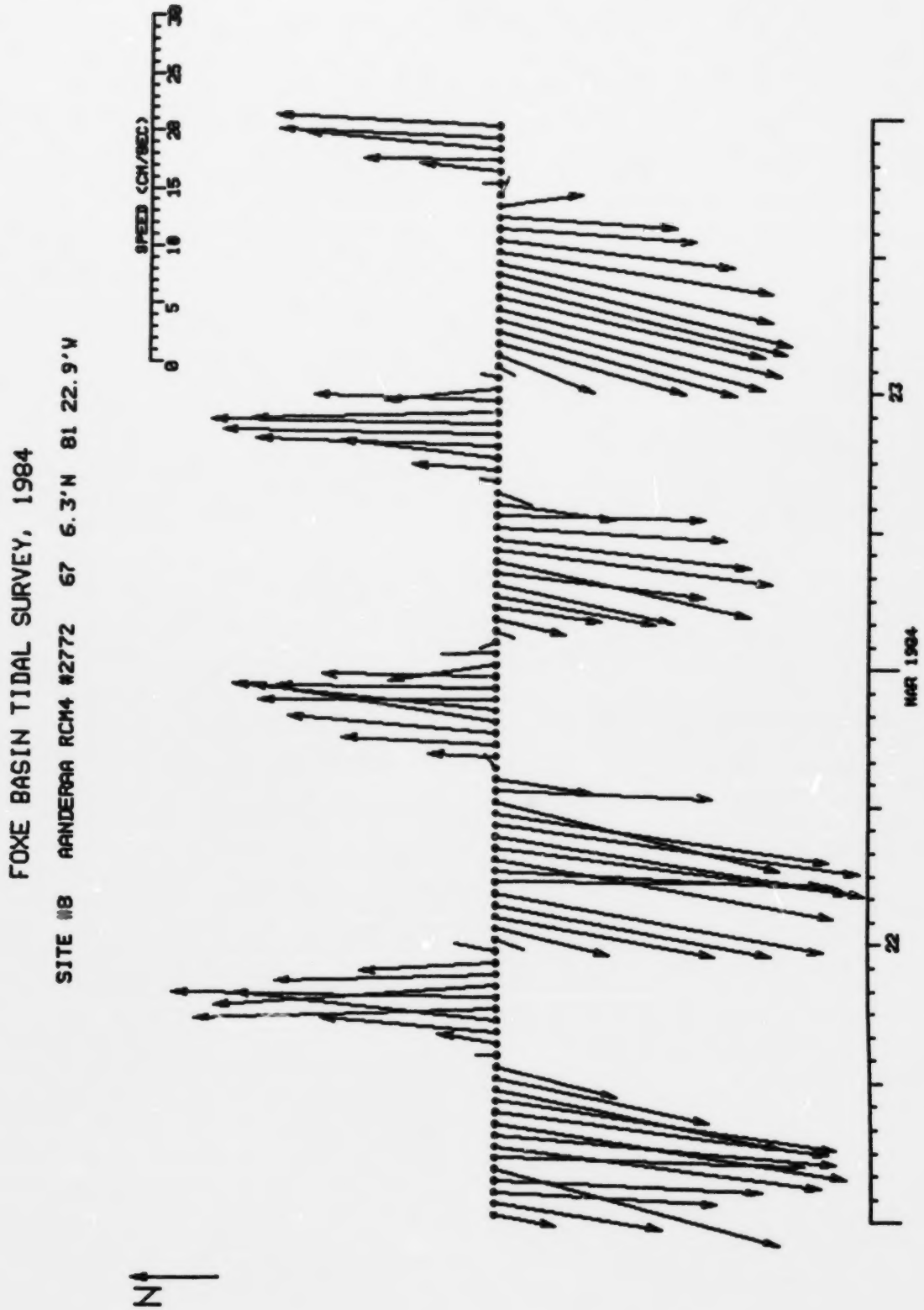
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W




FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
16
17
MAR 1984
N

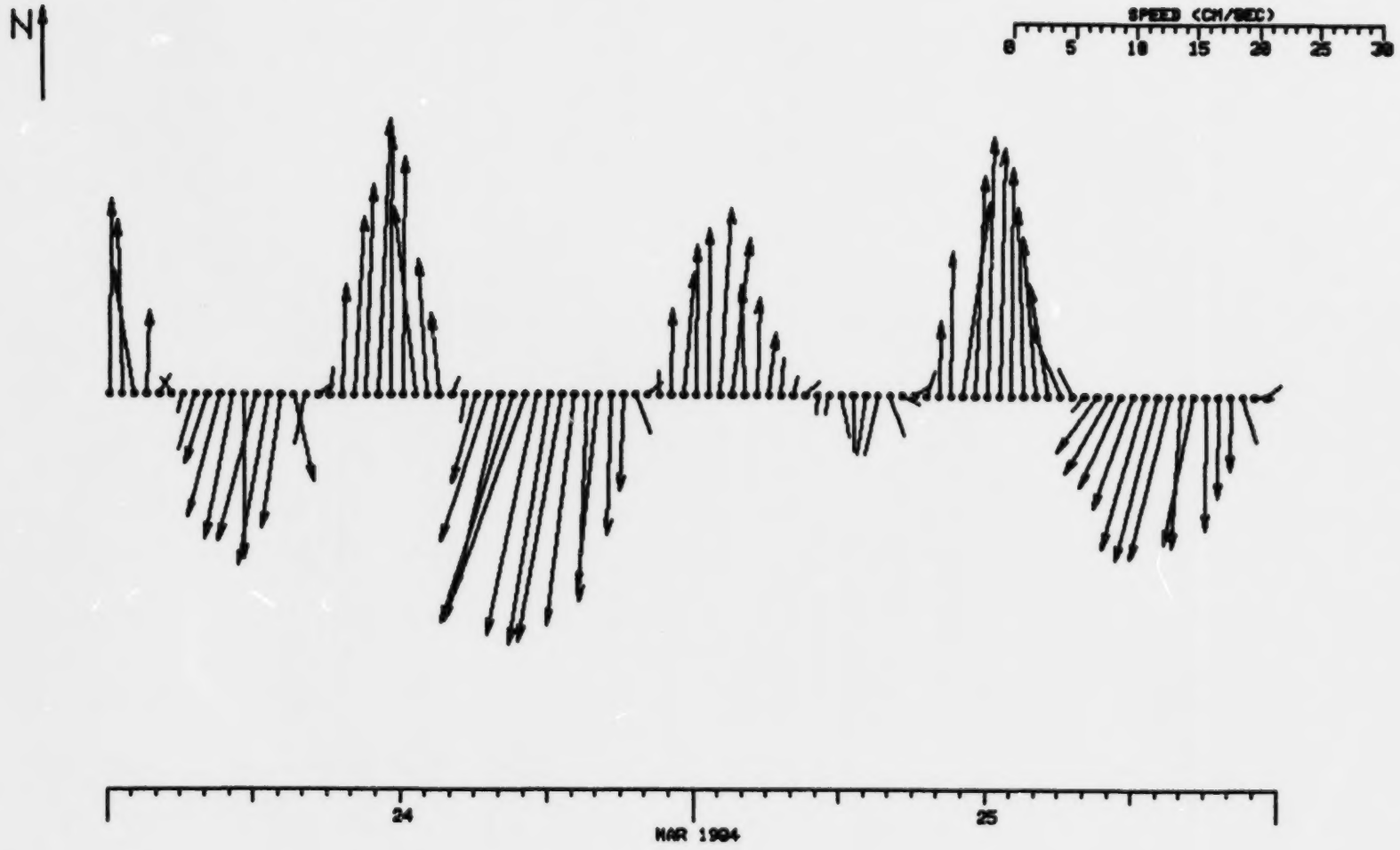

FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
N
10


FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
N
20
21
MAR 1984


FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
22
23
MAR 1984
N

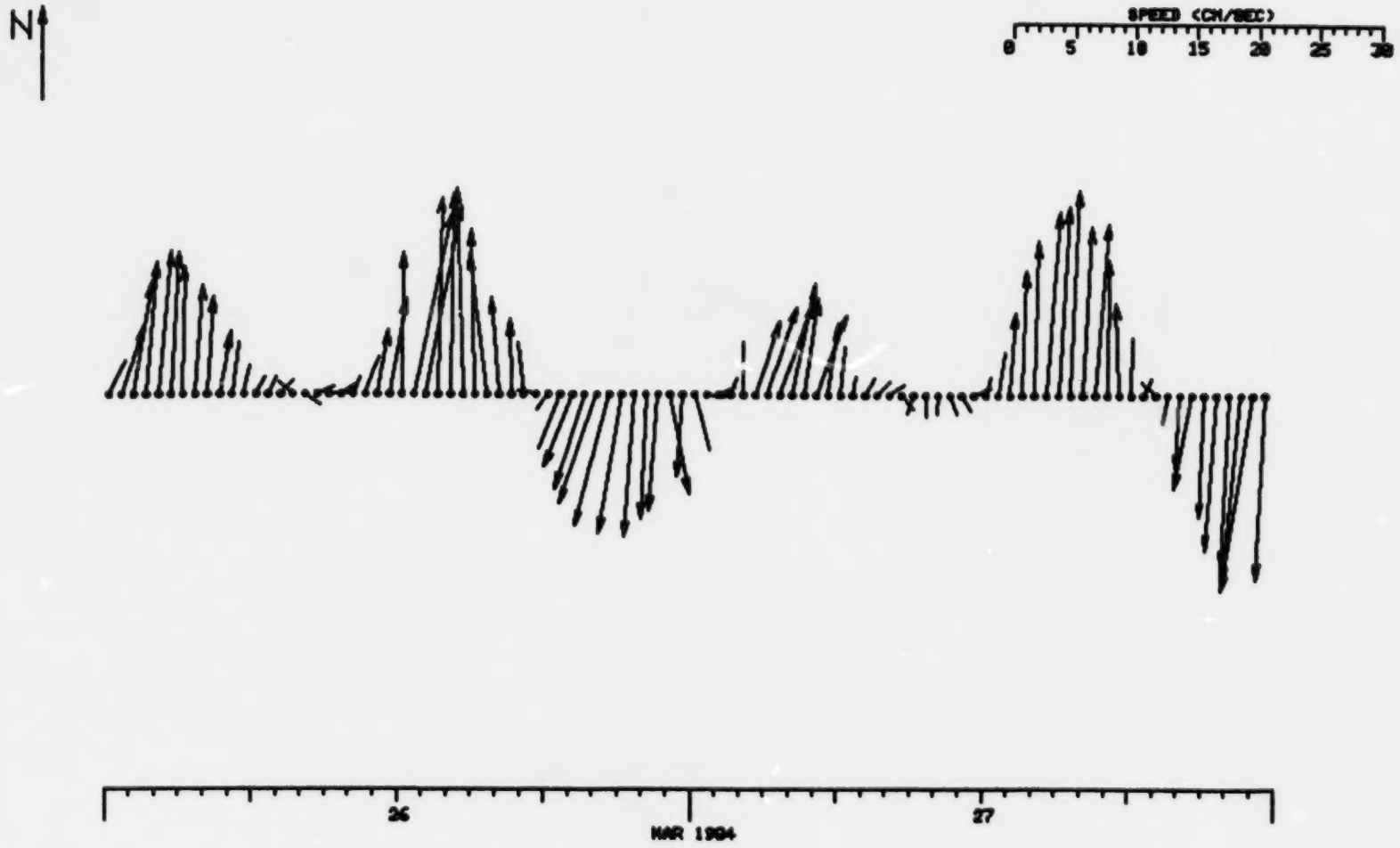
FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



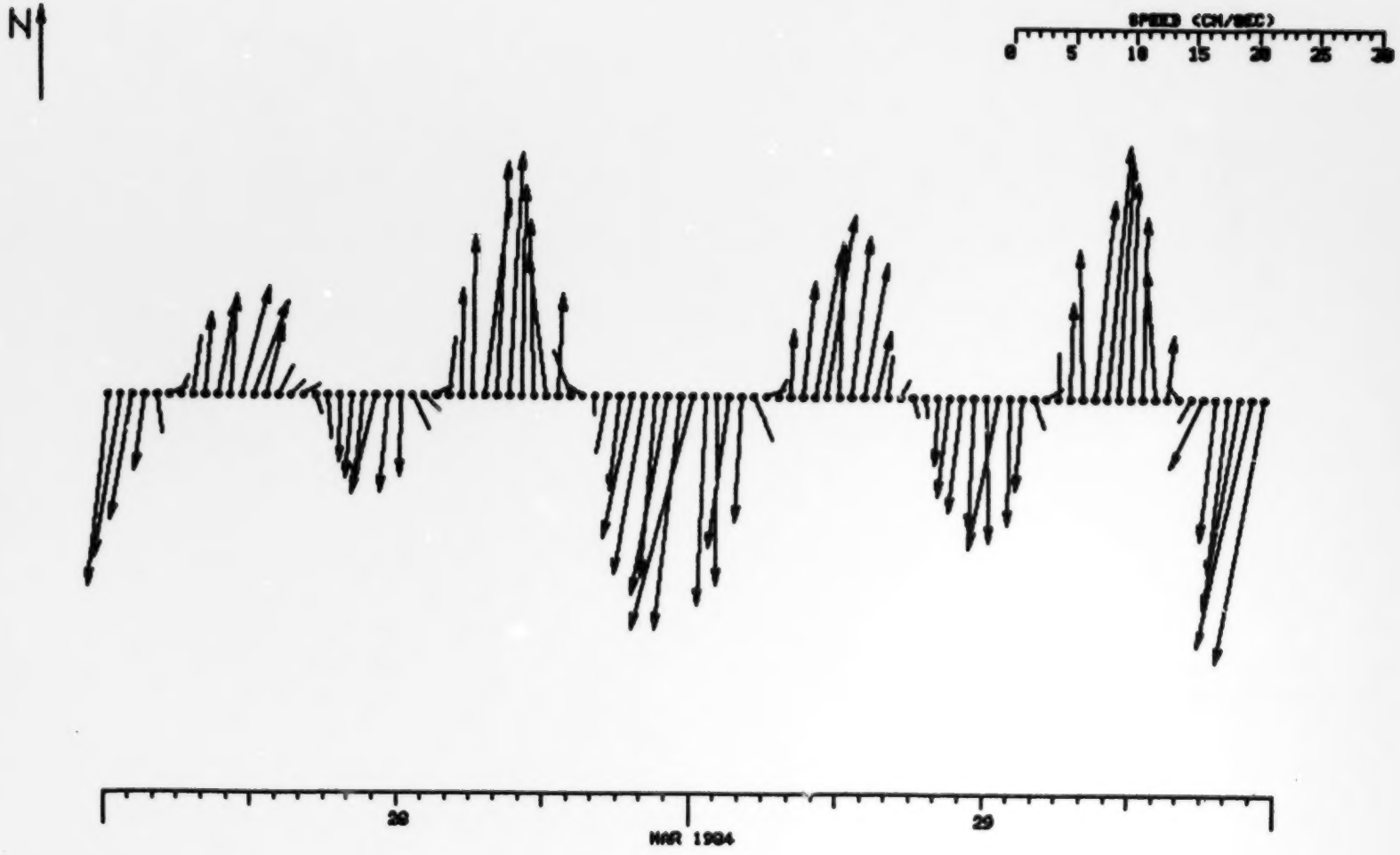
FOXE BASIN TIDAL SURVEY, 1984

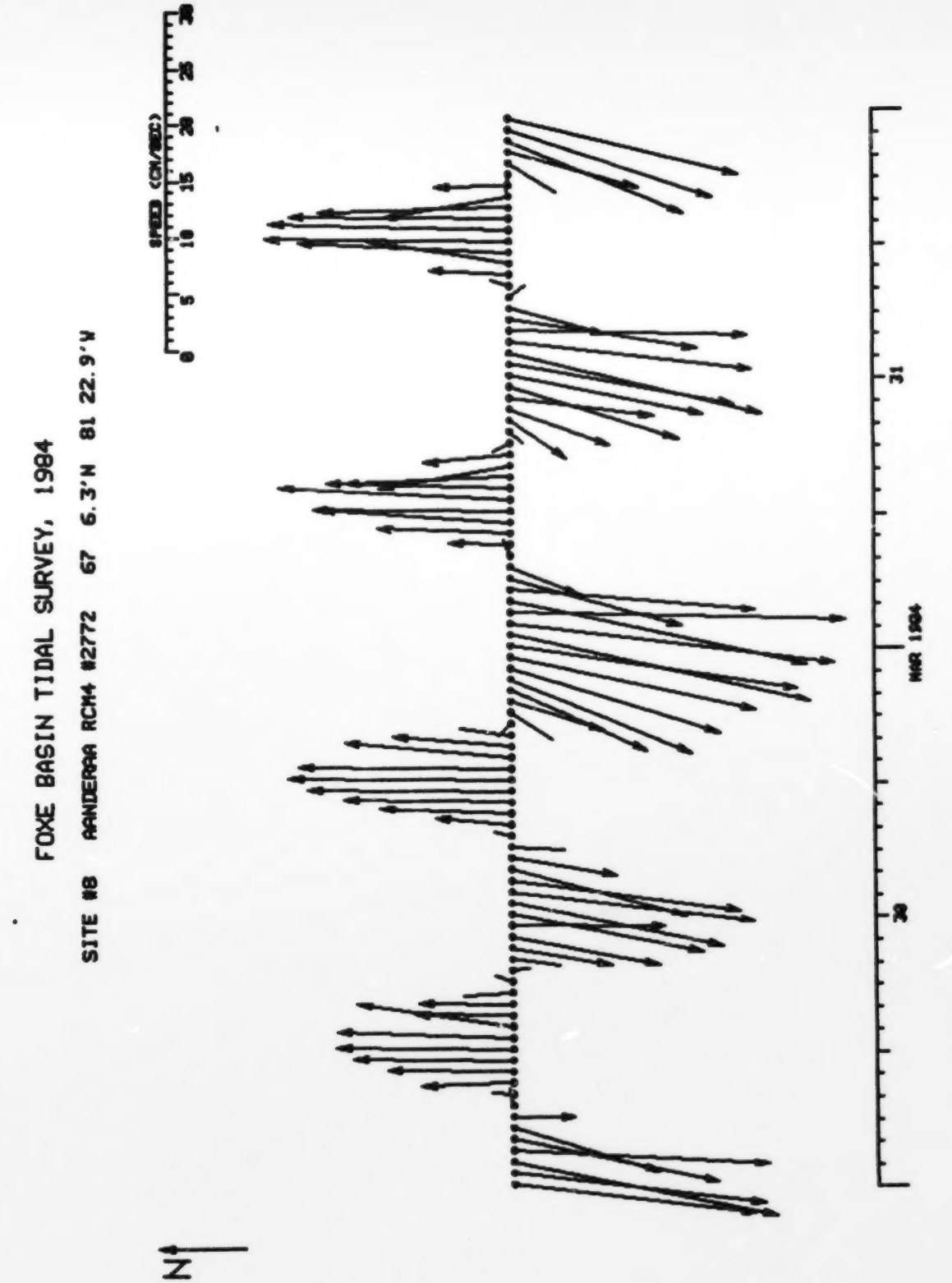
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W



FOXE BASIN TIDAL SURVEY, 1984

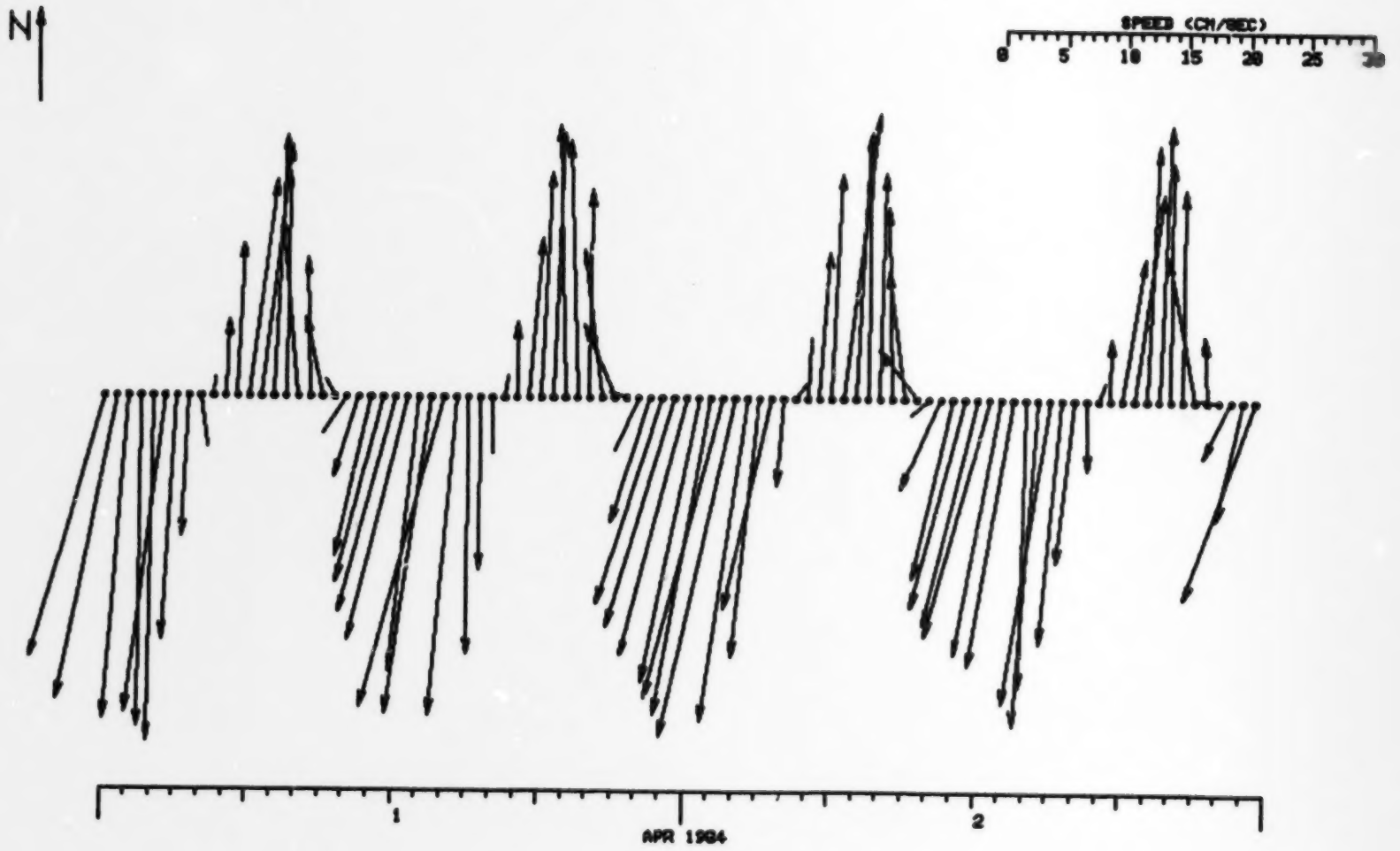
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W

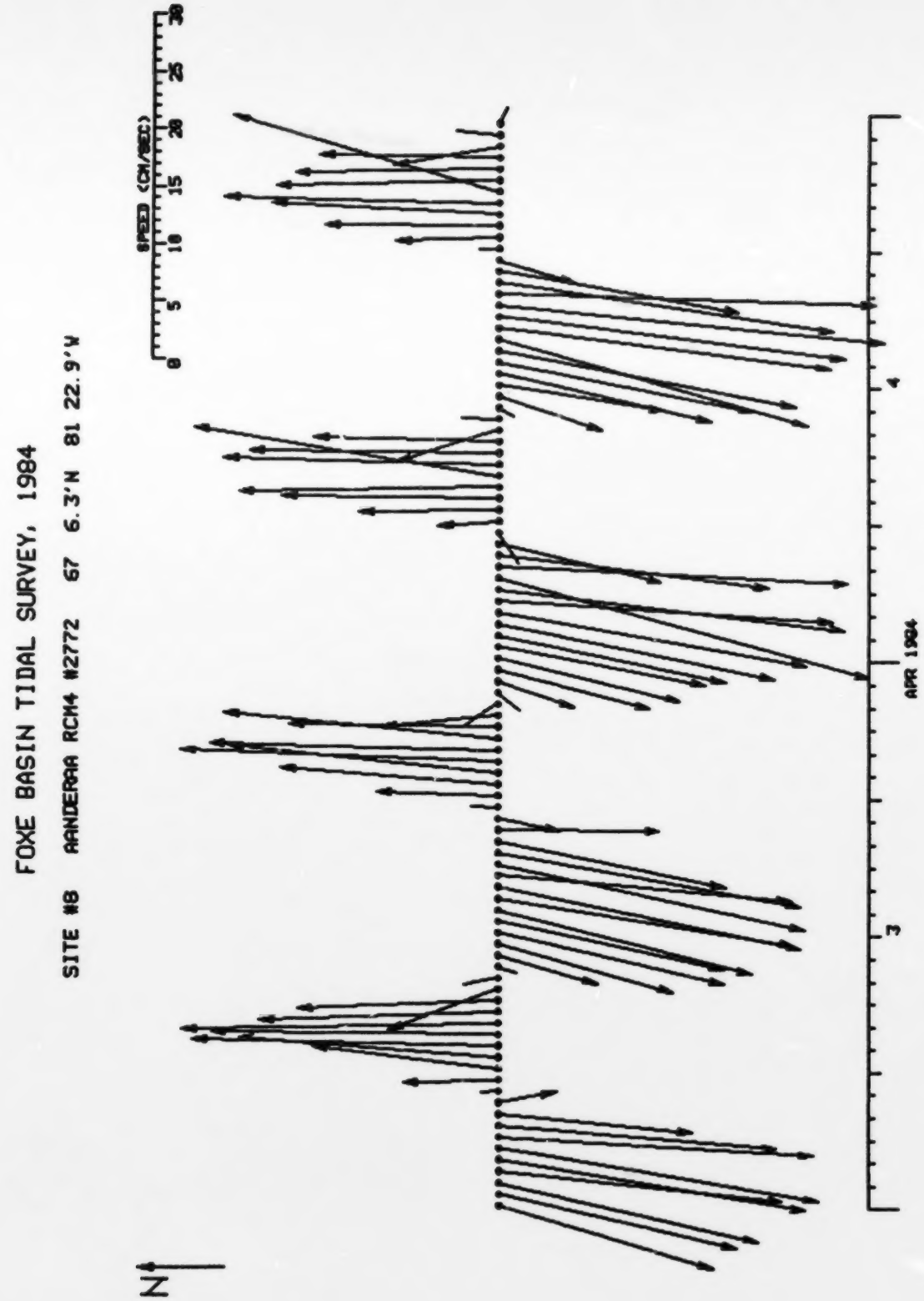


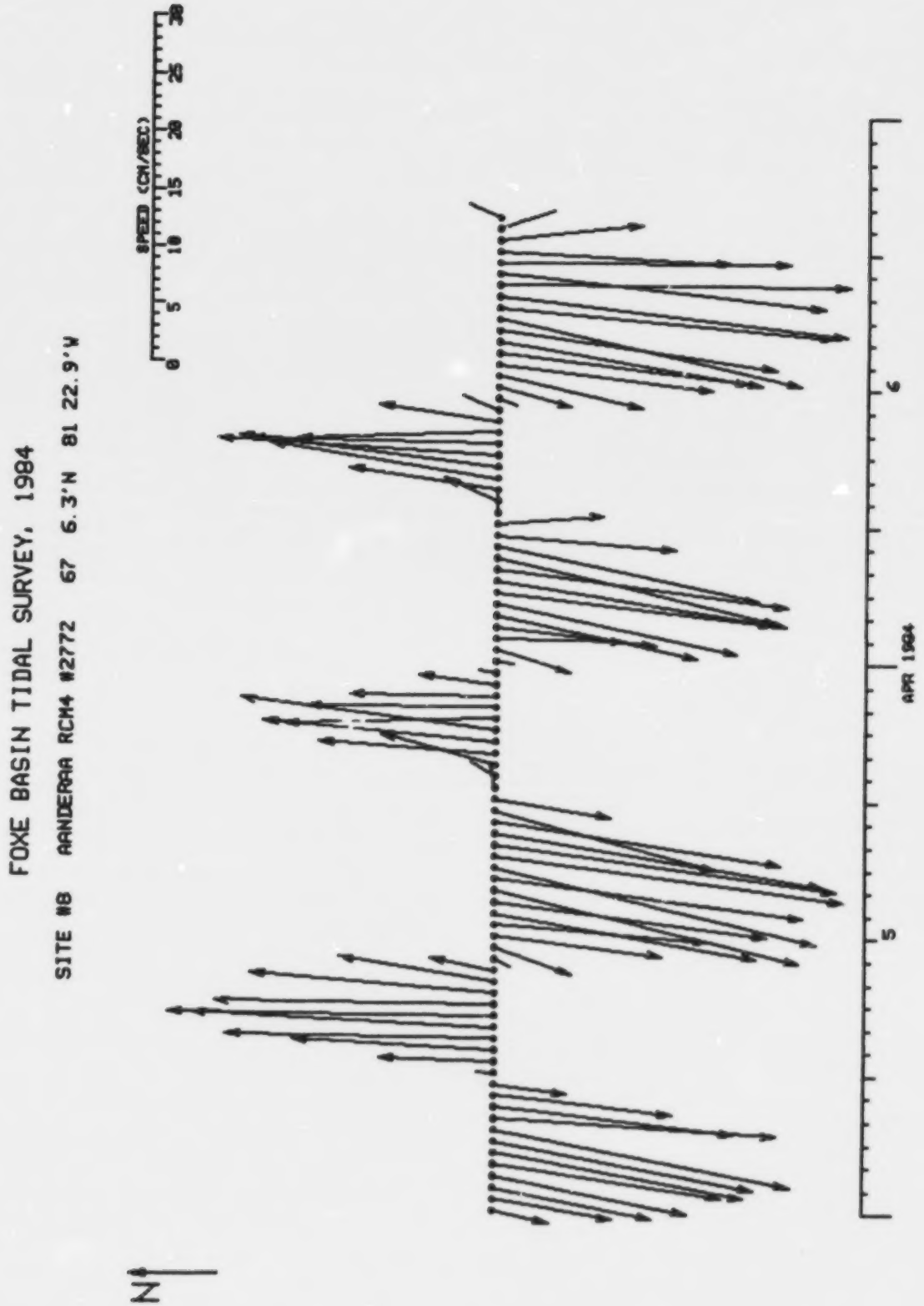

FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
31
MAR 1984
20
N

FOXE BASIN TIDAL SURVEY, 1984

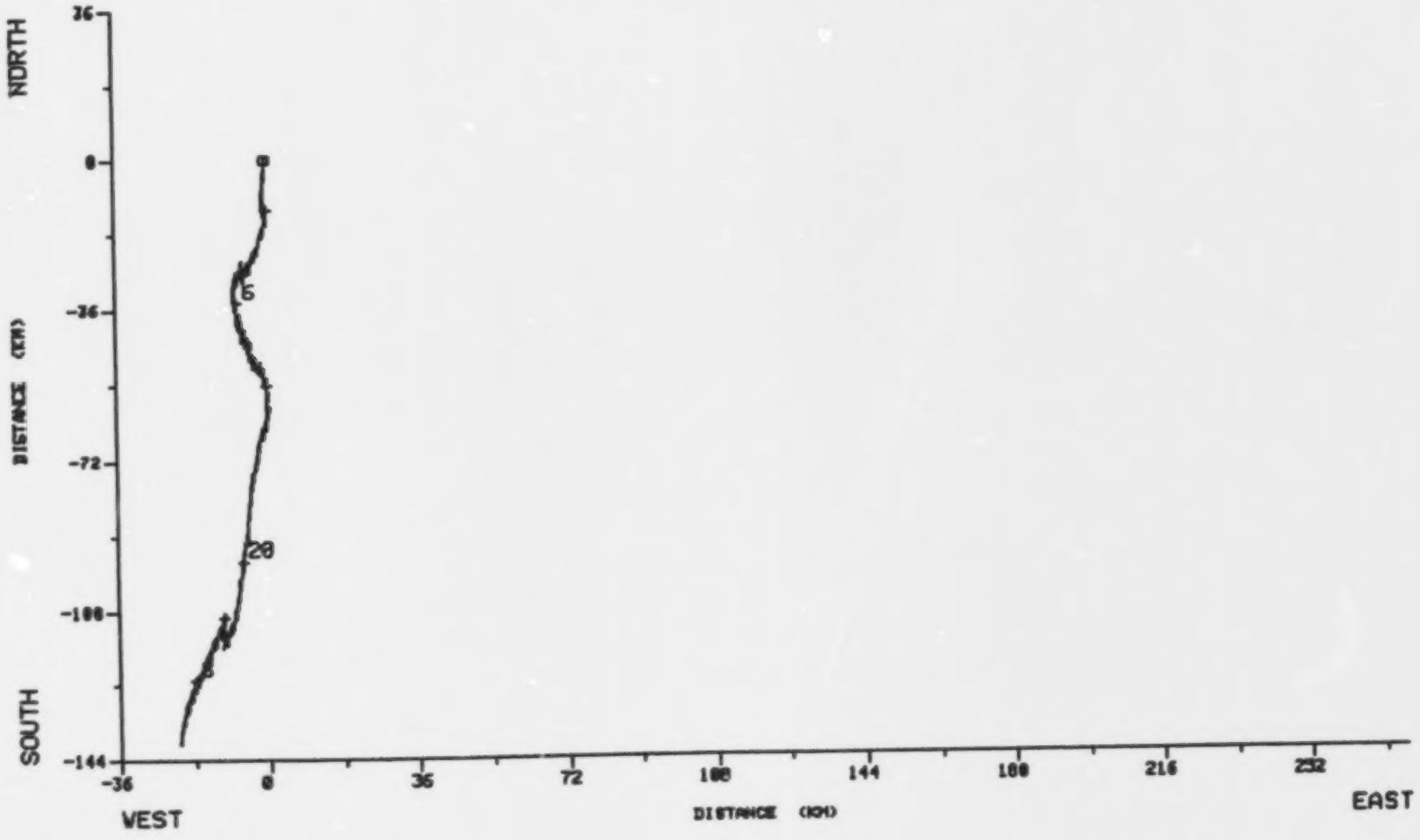
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W




FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
3
4
APR 1984
N


FOXE BASIN TIDAL SURVEY, 1984
SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W
SPEED (CM/SEC)
0
5
10
15
20
25
30
5
6
APR 1984
N

PROGRESSIVE VECTOR DIAGRAM
FOXE BASIN SITE #8 METER 2772/20 DEPTH(m) 6 TYPE DESPIKED
67 6'N 81 23'W AANDERAA DT(min) 15
TIME INTERVAL 21/02/84 - 6/04/84 LABELS ARE ELAPSED DAYS



3.5 Tidal Height Analysis

The analysis were performed according to the methods of G. Godin (1972) and M. Foreman (1977). The results are presented as amplitude and Greenwich phase (A, G) after correction for nodal modulation. In the last two columns AL and GL are the amplitude and phase before correction for nodal modulation.

Two of the tide gauges were started on the quarter hour. Since the tidal analysis routine required records on the hour, we performed a cubic spline interpolation between the data recorded at 30 minute intervals at 15 minutes after and before the hour. The cubic spline plots were compared with the plots of the original data and there were no perceptible differences. The interpolated data on the hour was then subjected, without filtering, to the tidal height analysis routine. The tides were then hind cast for the periods of deployment and the hindcast tides and the detided series plotted. The hindcasts were in good agreement with the data.

The tidal height analyses at the five sites are presented on the following five pages (119 to 123). The largest constituent is the M2 and the character of the tide is mixed, mainly semi diurnal.

Spring tide ranges can be estimated as twice the sum of the amplitude of the M2, S2, K1 and O1 constituent. These are listed in Table 5 below.

TABLE 5
Approximate Spring Tide Range

Site	Range (m)
1	3.87
2	1.35
3	2.43
5	1.83
8	2.59

The largest range is found in Steensby Inlet. The range decreases along the western shore site 8 to site 5 to site 2.

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS OF HOURLY TIDAL HEIGHTS

STN: SITE #1 LAT: 69 51 36.0 N
DEPTH: 40 M LONG: 78 29 48.0 W
START: 300Z 26/ 2/84 END: 2300Z 14/ 3/84
NO.OBS.= 429 NO.PTS.ANAL.= 429 MIDPT: 100Z 6/ 3/84

	NAME	FREQUENCY (CY/HR)	A (M)	G	AL (M)	GL
1	Z0	0.00000000	38.9474	0.00	38.9474	0.00
2	MSF	0.00282193	0.0998	244.29	0.0998	160.45
3	O1	0.03873065	0.1384	340.26	0.1488	113.57
4	K1	0.04178075	0.1466	64.40	0.1538	343.32
5	M2	0.08051139	1.0703	349.26	1.0589	44.99
6	S2	0.08333331	0.5806	71.21	0.5811	41.07
7	M3	0.12076712	0.0181	42.58	0.0178	306.38
8	SK3	0.12511408	0.0004	94.82	0.0004	343.60
9	M4	0.16102278	0.0344	239.47	0.0337	350.94
10	MS4	0.16384470	0.0377	311.66	0.0374	337.25
11	S4	0.16666669	0.0118	45.02	0.0118	344.75
12	2MK5	0.20280355	0.0029	239.59	0.0029	319.98
13	2SK5	0.20844740	0.0011	173.69	0.0012	32.34
14	M6	0.24153417	0.0101	123.06	0.0098	290.26
15	2MS6	0.24435616	0.0336	217.19	0.0329	298.51
16	2SM6	0.24717808	0.0201	301.92	0.0199	297.38
17	3MK7	0.28331494	0.0024	181.37	0.0024	267.49
18	M8	0.32204562	0.0009	63.71	0.0009	286.63

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS OF HOURLY TIDAL HEIGHTS

STN: SITE #2 LAT: 68 23 30.0 N
DEPTH: 10 M LONG: 82 8 54.0 W
START: 2000Z 21/ 2/84 END: 1800Z 8/ 4/84
NO.OBS.= 1127 NO.PTS.ANAL.= 1127 MIDPT: 700Z 16/ 3/84

	NAME	FREQUENCY (CY/HR)	A (M)	G	AL (M)	GL
1	Z0	0.00000000	8.7806	0.00	8.7806	0.00
2	MM	0.00151215	0.0410	338.03	0.0410	337.75
3	MSF	0.00282193	0.0932	245.99	0.0932	272.24
4	ALP1	0.03439657	0.0057	27.54	0.0062	307.08
5	2Q1	0.03570635	0.0079	44.75	0.0090	352.98
6	Q1	0.03721850	0.0136	325.87	0.0151	271.63
7	O1	0.03873065	0.1066	359.67	0.1147	303.05
8	NO1	0.04026860	0.0125	7.67	0.0161	164.30
9	K1	0.04178075	0.1194	73.22	0.1255	252.00
10	J1	0.04329290	0.0020	153.00	0.0023	328.58
11	OO1	0.04483084	0.0024	262.53	0.0033	136.28
12	UPS1	0.04634299	0.0042	35.06	0.0057	270.85
13	EPS2	0.07617730	0.0143	167.23	0.0150	271.84
14	MU2	0.07768947	0.0598	212.87	0.0599	313.72
15	N2	0.07899922	0.0491	187.46	0.0487	313.36
16	M2	0.08051139	0.2704	190.21	0.2674	315.84
17	L2	0.08202356	0.0740	167.05	0.0650	95.41
18	S2	0.08333331	0.1803	275.91	0.1804	65.77
19	ETA2	0.08507365	0.0178	7.50	0.0234	182.43
20	MO3	0.11924207	0.0128	299.78	0.0136	8.79
21	M3	0.12076712	0.0041	225.79	0.0040	234.43
22	MK3	0.12229216	0.0104	62.73	0.0108	7.14
23	SK3	0.12511408	0.0086	61.17	0.0090	29.82
24	MN4	0.15951067	0.0285	79.57	0.0279	331.10
25	M4	0.16102278	0.0613	116.36	0.0600	7.62
26	SN4	0.16233259	0.0144	168.74	0.0143	84.50
27	MS4	0.16384470	0.0544	182.18	0.0539	97.67
28	S4	0.16666669	0.0102	218.62	0.0102	158.34
29	2MK5	0.20280355	0.0016	84.20	0.0017	154.24
30	2SK5	0.20844740	0.0010	262.92	0.0010	21.43
31	2MN6	0.24002206	0.0097	187.71	0.0094	204.87
32	M6	0.24153417	0.0024	80.12	0.0023	97.01
33	2MS6	0.24435616	0.0062	196.13	0.0061	237.25
34	2SM6	0.24717808	0.0143	296.38	0.0142	1.74
35	3MK7	0.28331494	0.0024	228.11	0.0024	63.78
36	M8	0.32204562	0.0082	226.15	0.0078	8.66

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS OF HOURLY TIDAL HEIGHTS

STN: SITE #3 LAT: 68 12 6.0 N
DEPTH: 4 M LONG: 79 5 12.0 W
START: 2200Z 20/.2/84 END: 1600Z 6/ 4/84
NO.OBS.= 1099 NO.PTS.ANAL.= 1099 MIDPT: 1900Z 14/ 3/84

	NAME	FREQUENCY (CY/HR)	A (M)	G	AL (M)	GL
1	Z0	0.00000000	3.6454	0.00	3.6454	0.00
2	MM	0.00151215	0.0383	341.25	0.0383	0.56
3	MSF	0.00282193	0.0959	249.43	0.0959	312.26
4	ALP1	0.03439657	0.0076	12.18	0.0083	17.39
5	2Q1	0.03570635	0.0034	357.55	0.0038	48.48
6	Q1	0.03721850	0.0092	280.38	0.0101	348.48
7	O1	0.03873065	0.0712	326.88	0.0766	52.19
8	NO1	0.04026860	0.0059	321.77	0.0076	280.22
9	K1	0.04178075	0.0675	26.32	0.0709	26.59
10	J1	0.04329290	0.0034	39.42	0.0039	56.11
11	OO1	0.04483084	0.0012	271.63	0.0017	6.42
12	UPS1	0.04634299	0.0009	51.43	0.0011	167.89
13	EPS2	0.07617730	0.0215	148.55	0.0225	160.33
14	MU2	0.07768947	0.0871	204.29	0.0873	231.92
15	N2	0.07899922	0.1607	202.02	0.1593	271.76
16	M2	0.08051139	0.7016	228.11	0.6939	317.16
17	L2	0.08202356	0.0606	180.30	0.0533	91.67
18	S2	0.08333331	0.3719	302.16	0.3723	92.02
19	ETA2	0.08507365	0.0182	14.73	0.0239	212.31
20	MO3	0.11924207	0.0063	308.46	0.0067	122.83
21	M3	0.12076712	0.0019	182.52	0.0018	316.31
22	MK3	0.12229216	0.0049	67.22	0.0051	156.55
23	SK3	0.12511408	0.0037	78.71	0.0039	228.84
24	MN4	0.15951067	0.0177	48.74	0.0174	207.53
25	M4	0.16102278	0.0425	77.04	0.0416	255.16
26	SN4	0.16233259	0.0070	120.15	0.0070	339.75
27	MS4	0.16384470	0.0354	145.37	0.0350	24.29
28	S4	0.16666669	0.0064	196.56	0.0064	136.29
29	2MK5	0.20280355	0.0003	140.53	0.0003	318.91
30	2SK5	0.20844740	0.0008	245.79	0.0008	185.79
31	2MN6	0.24002206	0.0084	126.06	0.0082	13.91
32	M6	0.24153417	0.0062	145.61	0.0060	52.78
33	2MS6	0.24435616	0.0036	238.73	0.0035	206.71
34	2SM6	0.24717808	0.0036	236.46	0.0036	265.25
35	3MK7	0.28331494	0.0001	288.86	0.0001	196.30
36	M8	0.32204562	0.0048	182.42	0.0046	178.65

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS OF HOURLY TIDAL HEIGHTS

STN: SITE #5 LAT: 67 46 24.0 N
DEPTH: 22 M LONG: 81 45 36.0 W
START: 2400Z 21/ 2/84 END: 2000Z 6/ 4/84
NO.OBS.= 1077 NO.PTS.ANAL.= 1077 MIDPT: 1000Z 15/ 3/84

	NAME	FREQUENCY (CY/HR)	A (M)	G	AL (M)	GL
1	Z0	0.00000000	21.4467	0.00	21.4467	0.00
2	MM	0.00151215	0.0357	329.10	0.0357	340.25
3	MSF	0.00282193	0.0959	245.85	0.0959	293.44
4	ALP1	0.03439657	0.0070	39.35	0.0076	218.84
5	2Q1	0.03570635	0.0043	27.61	0.0049	245.71
6	Q1	0.03721850	0.0119	314.10	0.0131	181.19
7	O1	0.03873065	0.0845	359.58	0.0909	235.76
8	NO1	0.04026860	0.0093	358.91	0.0119	100.01
9	K1	0.04178075	0.0909	74.84	0.0955	209.49
10	J1	0.04329290	0.0004	165.55	0.0005	308.47
11	OO1	0.04483084	0.0029	281.44	0.0039	134.16
12	UPS1	0.04634299	0.0037	31.81	0.0050	258.05
13	EPS2	0.07617730	0.0151	151.26	0.0158	111.71
14	MU2	0.07768947	0.0612	202.70	0.0613	170.74
15	N2	0.07899922	0.0897	168.89	0.0889	172.09
16	M2	0.08051139	0.4817	190.15	0.4764	204.44
17	L2	0.08202356	0.0669	172.13	0.0589	0.57
18	S2	0.08333331	0.2593	271.80	0.2595	331.66
19	ETA2	0.08507365	0.0214	6.17	0.0281	104.36
20	MO3	0.11924207	0.0081	320.57	0.0086	211.03
21	M3	0.12076712	0.0015	167.45	0.0014	9.10
22	MK3	0.12229216	0.0090	80.94	0.0093	229.88
23	SK3	0.12511408	0.0054	74.58	0.0057	269.09
24	MN4	0.15951067	0.0183	78.90	0.0180	96.40
25	M4	0.16102278	0.0395	113.70	0.0386	142.29
26	SN4	0.16233259	0.0083	171.65	0.0082	234.72
27	MS4	0.16384470	0.0342	181.17	0.0338	255.33
28	S4	0.16666669	0.0050	202.05	0.0050	321.77
29	2MK5	0.20280355	0.0012	169.14	0.0012	332.38
30	2SK5	0.20844740	0.0007	320.03	0.0008	214.40
31	2MN6	0.24002206	0.0095	153.05	0.0093	184.85
32	M6	0.24153417	0.0130	190.52	0.0126	233.40
33	2MS6	0.24435616	0.0177	274.95	0.0173	3.41
34	2SM6	0.24717808	0.0058	323.79	0.0058	97.81
35	3MK7	0.28331494	0.0010	230.20	0.0010	47.73
36	M8	0.32204562	0.0036	98.65	0.0035	155.83

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS OF HOURLY TIDAL HEIGHTS

STN: SITE #8 LAT: 67 6 18.0 N
DEPTH: 37 M LONG: 81 22 54.0 W
START: 2400Z 21/ 2/84 END: 1700Z 6/ 4/84
NO.OBS.= 1074 NO.PTS.ANAL.= 1074 MIDPT: 800Z 15/ 3/84

	NAME	FREQUENCY (CY/HR)	A (M)	G	AL (M)	GL
1	Z0	0.00000000	34.5590	0.00	34.5590	0.00
2	MM	0.00151215	0.0293	311.03	0.0293	323.27
3	MSF	0.00282193	0.0930	243.10	0.0930	292.72
4	ALP1	0.03439657	0.0049	28.83	0.0054	233.09
5	2Q1	0.03570635	0.0029	53.23	0.0032	297.04
6	Q1	0.03721850	0.0076	327.61	0.0084	221.48
7	O1	0.03873065	0.0614	7.12	0.0660	271.18
8	NO1	0.04026860	0.0044	9.38	0.0057	139.54
9	K1	0.04178075	0.0589	88.05	0.0619	252.78
10	J1	0.04329290	0.0009	8.91	0.0010	183.05
11	OO1	0.04483084	0.0030	293.53	0.0041	178.49
12	UPS1	0.04634299	0.0022	40.78	0.0030	300.43
13	EPS2	0.07617730	0.0153	130.80	0.0159	146.07
14	MU2	0.07768947	0.0580	176.36	0.0581	200.38
15	N2	0.07899922	0.1559	139.99	0.1546	200.07
16	M2	0.08051139	0.7963	172.85	0.7876	245.11
17	L2	0.08202356	0.0777	174.63	0.0684	62.13
18	S2	0.08333331	0.3777	251.55	0.3781	11.41
19	ETA2	0.08507365	0.0222	8.50	0.0292	167.94
20	MO3	0.11924207	0.0050	333.42	0.0053	309.74
21	M3	0.12076712	0.0006	229.84	0.0006	158.42
22	MK3	0.12229216	0.0050	100.35	0.0052	337.34
23	SK3	0.12511408	0.0042	104.18	0.0044	28.77
24	MN4	0.15951067	0.0076	128.84	0.0074	261.17
25	M4	0.16102278	0.0165	162.32	0.0162	306.83
26	SN4	0.16233259	0.0024	258.63	0.0024	78.56
27	MS4	0.16384470	0.0145	238.78	0.0144	70.89
28	S4	0.16666669	0.0019	325.29	0.0019	205.01
29	2MK5	0.20280355	0.0013	209.21	0.0013	158.46
30	2SK5	0.20844740	0.0006	309.11	0.0006	353.56
31	2MN6	0.24002206	0.0146	164.05	0.0141	8.64
32	M6	0.24153417	0.0242	207.56	0.0234	64.34
33	2MS6	0.24435616	0.0344	290.78	0.0337	195.16
34	2SM6	0.24717808	0.0096	5.29	0.0095	317.27
35	3MK7	0.28331494	0.0003	209.17	0.0003	230.68
36	M8	0.32204562	0.0030	78.22	0.0029	7.26

3.6 Tidal Stream Analysis

The tidal stream analyses were performed according to the method of G. Godin (1972) and M. Foreman (1978). The results are presented as the amplitudes of the major and minor axes of each constituent ellipse, the inclination of the northern semi major axis counter-clockwise from east, the Greenwich phase of the current when it runs along the northern major semi axis and the Greenwich phase of the counter-clockwise and clockwise rotating vectors.

The current meters were started at 8 minutes and 32 minutes after the hour. Once again cubic spline interpolations between data points spaced at 15 minute intervals were performed on the U and V components of the velocity vector. The values on the hour were used in the tidal stream analyses. No filtering was employed in this subsampling. Hindcasts were performed to check the validity of the analyses.

The tidal stream analyses at the two sites are presented on the following four pages (125 to 128). The largest constituent is the M2 and the character of the tidal streams in semi diurnal.

Spring tidal currents can be estimated by the sum of the amplitudes of the semi major axes of the largest constituent ellipses: O1, K1, MU2, N2, M2, L2, S2, MN4, M4, MS4, and 2MS6.

TABLE 6
Approximate Speed of Spring Tidal Current

Site 1	43 cm s^{-1}
Site 8	45 cm s^{-1}

The tidal currents are more dominated by the semi diurnal constituents than are the tidal heights. The shallow water constituents are non-negligible at both current meter sites but more pronounced in Steensby Inlet (site 1).

FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS RESULTS IN CURRENT ELLIPSE FORM
DATA IS ASSUMED TO BE UNFILTERED

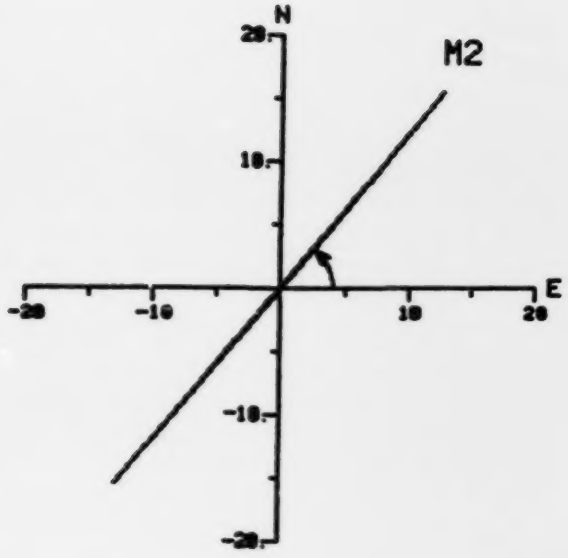
STN: SITE #1 LAT: 69 51 36.0 N
DEPTH: 6 M LONG: 78 29 48.0 W
START: 2100Z 25/ 2/84 END: 1400Z 7/ 4/84

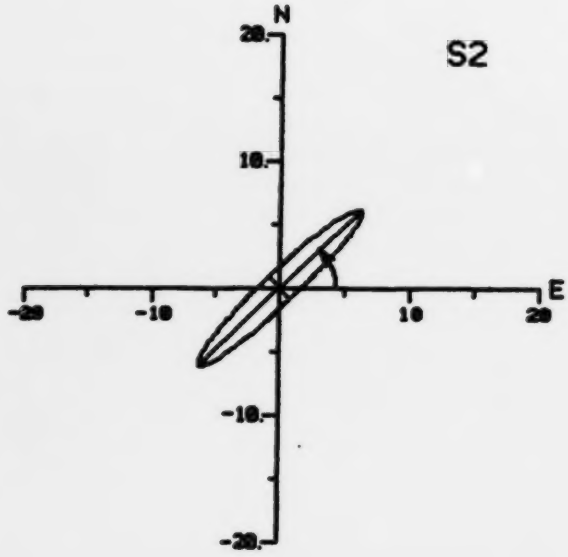
	NAME	FREQUENCY (CY/HR)	MAJOR (CM/S)	MINOR (CM/S)	INC	G	G+	G-
1	Z0	0.00000000	1.702	0.000	107.6	360.0	252.4	107.6
2	MM	0.00151215	0.623	0.308	33.5	70.3	36.8	103.9
3	MSF	0.00282193	5.120	-0.517	89.7	67.6	337.9	157.4
4	ALP1	0.03439657	0.232	0.164	97.3	260.4	163.1	357.7
5	2Q1	0.03570635	0.264	-0.054	58.5	240.8	182.4	299.3
6	Q1	0.03721850	0.386	-0.149	25.8	226.1	200.3	252.0
7	O1	0.03873065	0.947	-0.538	61.0	245.5	184.5	306.5
8	NO1	0.04026860	0.160	0.031	130.9	119.7	348.8	250.7
9	K1	0.04178075	0.777	-0.452	85.6	316.4	230.8	42.0
10	J1	0.04329290	0.093	-0.062	145.5	310.7	165.2	96.1
11	OO1	0.04483084	0.131	-0.023	132.7	320.2	187.5	92.9
12	UPS1	0.04634299	0.152	-0.115	176.2	296.7	120.5	112.9
13	EPS2	0.07617730	0.484	-0.222	92.2	115.1	22.9	207.3
14	MU2	0.07768947	1.710	-0.956	117.5	135.2	17.8	252.7
15	N2	0.07899922	3.310	0.202	52.3	210.2	157.9	262.5
16	M2	0.08051139	20.005	0.038	50.5	242.7	192.2	293.2
17	L2	0.08202356	2.139	0.639	40.0	257.7	217.7	297.6
18	S2	0.08333331	8.695	-1.222	44.8	319.4	274.6	4.1
19	ETA2	0.08507365	0.544	-0.063	45.9	85.5	39.6	131.5
20	MO3	0.11924207	0.721	-0.311	102.6	16.8	274.2	119.4
21	M3	0.12076712	0.258	0.100	52.3	321.1	268.8	13.4
22	MK3	0.12229216	0.640	0.087	97.7	103.2	5.5	200.9
23	SK3	0.12511408	0.414	-0.175	125.9	88.3	322.4	214.2
24	MN4	0.15951067	0.283	0.084	22.0	54.6	32.5	76.6
25	M4	0.16102278	1.006	-0.404	134.4	272.6	138.2	47.0
26	SN4	0.16233259	0.603	-0.407	147.5	316.7	169.2	104.2
27	MS4	0.16384470	2.129	-1.028	116.5	337.5	221.0	94.0
28	S4	0.16666669	0.614	-0.087	105.2	146.5	41.3	251.7
29	2MK5	0.20280355	0.244	0.017	162.5	183.3	20.9	345.8
30	2SK5	0.20844740	0.270	0.034	133.0	253.2	120.2	26.3
31	2MN6	0.24002206	0.682	-0.387	103.1	323.0	219.9	66.1
32	M6	0.24153417	0.943	-0.081	99.8	34.3	294.5	134.1
33	2MS6	0.24435616	1.905	-0.365	107.1	112.8	5.7	219.9
34	2SM6	0.24717808	0.813	-0.125	105.9	188.0	82.1	293.9
35	3MK7	0.28331494	0.418	-0.092	138.5	314.9	176.4	93.4
36	M8	0.32204562	0.337	0.122	158.2	307.4	149.3	105.6

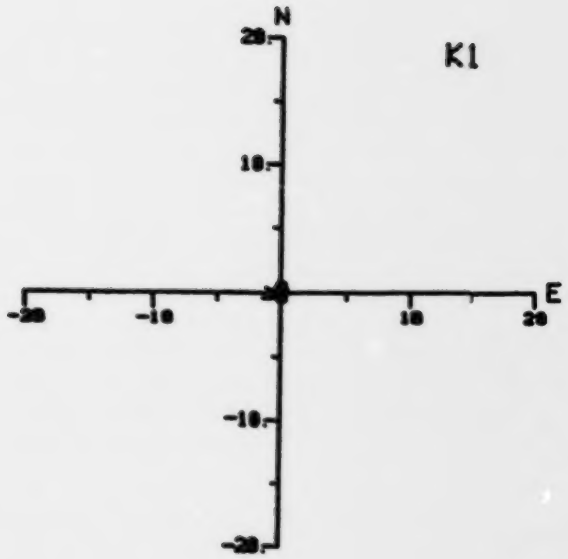
FOXE BASIN TIDAL SURVEY, 1984

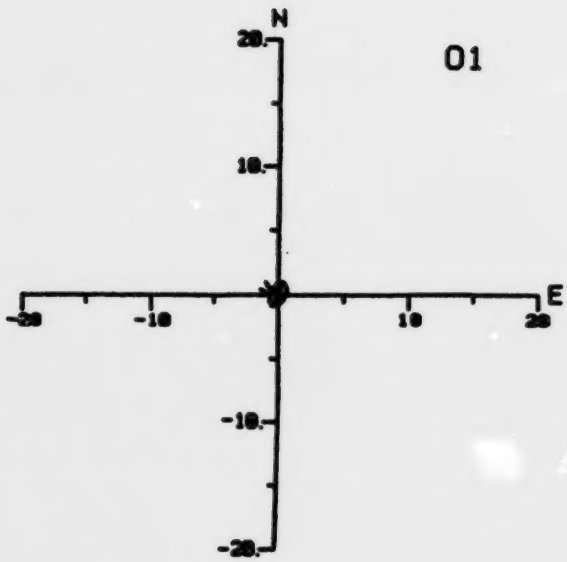
SITE #1 AANDERAA RCM4 #2775 69 51.6'N 78 29.8'W

ARROWS INDICATE CONVENTION FOR ORIENTATION OF CURRENT ELLIPSES. UNITS ARE CM/SEC.









FOXE BASIN TIDAL SURVEY, 1984

ANALYSIS RESULTS IN CURRENT ELLIPSE FORM
DATA IS ASSUMED TO BE UNFILTERED

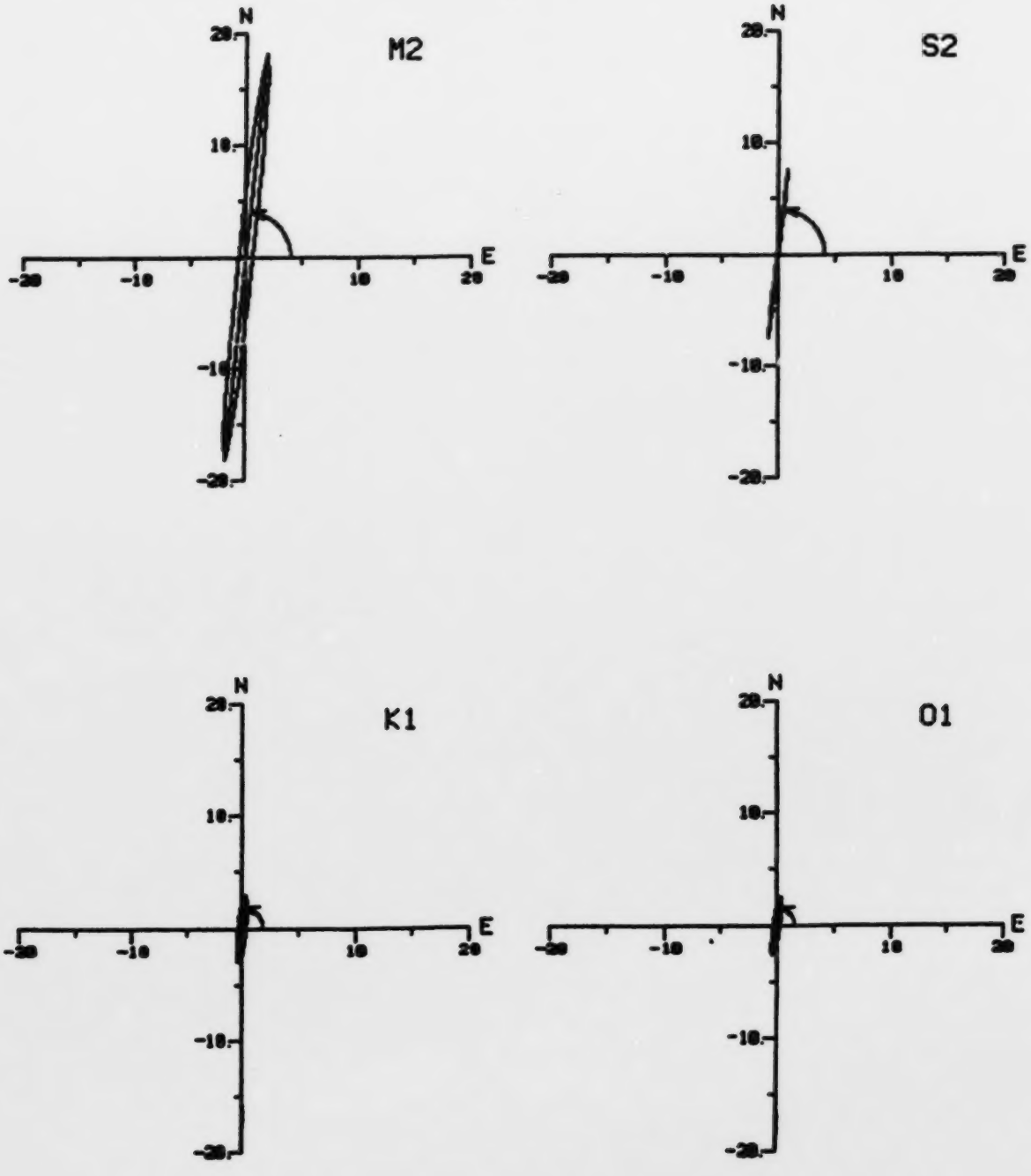
STN: SITE #8 LAT: 67 6 18.0 N
DEPTH: 6 M LONG: 81 22 54.0 W
START: 2300Z 19/ 2/84 END: 1900Z 6/ 4/84

	NAME	FREQUENCY (CY/HR)	MAJOR (CM/S)	MINOR (CM/S)	INC	G	G+	G-
1	Z0	0.00000000	3.510	0.000	84.2	180.0	95.8	264.2
2	MM	0.00151215	1.611	-0.414	107.7	171.0	63.3	278.7
3	MSF	0.00282193	2.552	0.179	63.7	222.0	158.3	285.7
4	ALP1	0.03439657	0.203	-0.121	94.3	231.0	136.7	325.2
5	2Q1	0.03570635	0.630	0.068	88.6	301.1	212.5	29.8
6	Q1	0.03721850	0.311	0.050	124.5	174.3	49.8	298.8
7	O1	0.03873065	2.662	0.300	81.5	177.6	96.1	259.2
8	NO1	0.04026860	0.313	0.008	38.0	107.0	69.0	145.0
9	K1	0.04178075	3.014	0.388	84.1	242.9	158.8	326.9
10	J1	0.04329290	0.433	0.007	63.7	120.8	57.1	184.5
11	OO1	0.04483084	0.534	0.041	76.5	181.8	105.3	258.3
12	UPS1	0.04634299	0.328	0.016	60.2	121.0	60.9	181.2
13	EPS2	0.07617730	0.585	0.096	97.2	239.3	142.1	336.5
14	MU2	0.07768947	0.649	-0.145	50.8	82.5	351.7	173.3
15	N2	0.07899922	3.455	0.075	81.9	139.8	58.0	221.7
16	M2	0.08051139	18.331	0.647	84.1	184.2	100.2	268.3
17	L2	0.08202356	3.405	0.323	82.4	283.2	200.8	5.6
18	S2	0.08333331	7.552	0.079	83.6	239.9	156.3	323.6
19	ETA2	0.08507365	1.154	0.234	81.4	92.5	11.1	173.9
20	MO3	0.11924207	0.842	-0.004	84.3	31.4	307.2	115.7
21	M3	0.12076712	0.445	-0.062	81.2	335.1	254.0	56.3
22	MK3	0.12229216	0.465	-0.082	85.0	77.0	352.0	162.0
23	SK3	0.12511408	0.300	-0.032	71.1	155.8	84.7	227.0
24	MN4	0.15951067	1.128	0.075	93.7	302.0	208.3	35.7
25	M4	0.16102278	2.536	0.288	90.9	325.0	234.0	55.9
26	SN4	0.16233259	0.157	0.021	125.5	231.4	105.9	356.8
27	MS4	0.16384470	1.987	0.261	85.0	28.9	304.0	113.9
28	S4	0.16666669	0.493	0.027	78.1	49.7	331.6	127.8
29	2MK5	0.20280355	0.098	0.006	84.2	85.0	0.8	169.1
30	2SK5	0.20844740	0.122	-0.042	135.3	63.3	288.0	198.5
31	2MN6	0.24002206	0.176	0.021	27.7	199.1	171.5	226.8
32	M6	0.24153417	0.355	-0.123	90.1	323.0	232.9	53.1
33	2MS6	0.24435616	0.559	-0.131	79.6	15.7	296.1	95.3
34	2SM6	0.24717808	0.173	-0.037	68.1	84.2	16.1	152.3
35	3MK7	0.28331494	0.111	0.045	67.4	233.8	166.4	301.2
36	M8	0.32204562	0.231	-0.041	92.8	359.1	266.2	91.9

FOXE BASIN TIDAL SURVEY, 1984

SITE #8 AANDERAA RCM4 #2772 67 6.3'N 81 22.9'W

ARROWS INDICATE CONVENTION FOR ORIENTATION OF CURRENT ELLIPSES. UNITS ARE CM/SEC.



3.7 Discussion

The data collected should be representative of their general locations in Foxe Basin with the probable exception of the data from site 2 located within Roche Bay. The position of this site was dictated by extremely unstable ice conditions outside the bay. The bay, however, is shallow (approximately 15 to 20 m depth over much of its area) with an irregular bottom. Therefore, the data from this site is probably representative only of the local conditions within the bay.

Construction of cotidal charts of northwestern Foxe Basin proved difficult. The reported presence of an M2 amphidrome between Hall Beach and Rowley Island could contribute to the confusing distribution of phases. The phases of the diurnal and semi diurnal tidal heights are suggestive of differing propagation paths. If the Steensby Inlet location is ignored for the present, the data suggests the diurnal tides cresting at site 3, 2, 5 and 8 in chronological order. The diurnal tides therefore appear to travel anti-clockwise around northern Foxe Basin. On the other hand, the semi diurnal crests arrive chronologically at site 8, 5, 2 and 3 suggesting a clockwise propagation around the basin.

The above conclusions based solely upon tidal height phases are confirmed by the relative phases of the tidal heights and tidal currents at site 1 (see Table 7). At site 8 the major axes of the diurnal ellipses are nearly 180° out of phase with the tidal heights suggesting southward propagation, while the semi diurnal current and height oscillation are in phase implying northward propagation.

At site 1 in Steensby Inlet, the major tidal current constituents are nearly in quadrature with the tidal height constituents. This observation coupled with the enhanced amplitude of all the tidal height constituents at site 1 indicates the existence of near-standing wave forms in Steensby Inlet: apparently the "end" of the Foxe Basin System.

Shallow water components are, not surprisingly, non-negligible to all sites often exceeding the K1 constituent amplitude.

TABLE 7 Summary of Major Tidal Consituents

Heights

	O_1	K_1	N_2	M_2	L_2	S_2	M_4	MS_4
Site 8	.061 007	.059 088	.156 140	.796 173	.078 175	.378 252	.017 162	.015 239
Site 5	.085 000	.091 075	.090 169	.482 190	.067 172	.259 272	.040 114	.034 181
Site 2	.107 000	.119 073	.049 187	.270 190	.074 167	.180 276	.061 116	.054 182
Site 3	.071 327	.068 026	.161 202	.702 228	.061 180	.372 302	.043 077	.035 145
Site 1	.138 340	.147 064	--	1.070 349	--	.581 071	.034 239	.038 312

Tidal Currents

	O_1	K_1	N_2	M_2	L_2	S_2	M_4	MS_4
Site 8	2.66 178	3.01 243	3.46 140	18.33 184	3.41 283	7.55 240	2.54 325	1.99 029
Site 1	0.95 246	0.78 316	3.31 210	20.01 243	2.14 258	8.70 319	1.01 273	2.13 338

Phase Differences (Ht - Current)

Site 8	+189	+155	000	-011	-108	+012	not truly propagating
Site 1	+094	+108	---	+106	---	+112	constitutents

Positive phase differences indicate current leads height

Negative phase differences indicate current lags height

The image of progressive waves transporting energy northward into Foxe Basin where it is largely dissipated by bottom and under-ice friction is thus presented. It should be noted that significantly different values of amplitude and phase could occur during the ice-free season when the frictional dissipation is much reduced.

The current meters, equipped with temperature and conductivity sensors both measured water temperature at or near the freezing point and salinities gradually increasing over the period of deployment. These occurrences are characteristic of a shallow region where brine exclusion by growing sea ice increases the salinity (and thickness) of the under-ice mixed layer. A region 30 m deep at salinity of 33 and ice growth of 1 cm per day produces the following increase is <u>average</u> salinity of the water column.

$$H S_0 = (H-h)S + h (S-\Delta s) \qquad (1)$$

differentiating with respect to time,

$$0 = H \frac{ds}{dt} - \frac{dh}{dt} S - h \frac{ds}{dt} + \frac{dh}{dt} S - \frac{dh}{dt}\Delta S + h \frac{ds}{dt} - h \frac{d\Delta s}{dt} \qquad (2)$$

$$H \frac{ds}{dt} = \frac{dh}{dt} \Delta S + h \frac{d(\Delta S)}{dt} \qquad (3)$$

where H is the total depth, S_0 the initial average salinity of the water column before ice formation, h is the increasing ice thickness, S the instantaneous salinity of the water column and ΔS the difference in salinity between the sea water and the ice. The last term in equation 3 can be ignored since the salinity of ice, in general, increases with the salinity of the water from which it is formed; yielding:

$$H \frac{ds}{dt} = \frac{dh}{dt}\Delta S \qquad (4)$$

and

$$\frac{ds}{dt} = \frac{\Delta S}{H} \frac{dh}{dt} \qquad (5)$$

ΔS for the normal range of sea water salinities is about 27 so that:

$$\frac{ds}{dt} = \frac{27}{50\ m}\ \frac{.01\ m}{day} = 0.0054/day$$

Over the 47 days of measurement one would expect, therefore, an increase in salinity of the water column of about 0.25. In a region 25 m deep, the increase would be about 0.50. These figures are in good agreement with those measured at sites 1 and 8, and suggest that the under ice mixed layer extends to the bottom.

The near absence of the effects of wind stress, and the shallowness of the area coupled with strong tidal flows make Northern Foxe Basin an excellent candidate for tidal rectifications due to frictional effects described for example by Huthnace (1973) and Loder (1980).

Further studies of Foxe Basin should include summer deployments of both tide gauges and current meters. In particular, current measurements in winter were impossible in the vicinity of Fury and Hecla Strait due to the presence of the Polynya or very thin ice. This energetic region probably has a great influence on the tides and the oceanographic characteristics of Northern Foxe Basin.

4. REFERENCES

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Huthnace, J.M. (1973). Tidal Current Asymmetries over the Norfolk Sandbanks. Estuarine Coast Mar. Sci. V.1, 89-99.

Loder, J.W. (1980). Topographic Rectification of Tidal Currents on the Sides of Georges Bank. Journal of Physical Oceanography V.10, 1399-1416.

APPENDIX I

March, 1984

REPORT

TIDAL PROPAGATION MEASUREMENTS IN THE FOXE BASIN, N.W.T.
FIELD OPERATIONS DURING FEBRUARY AND MARCH, 1984

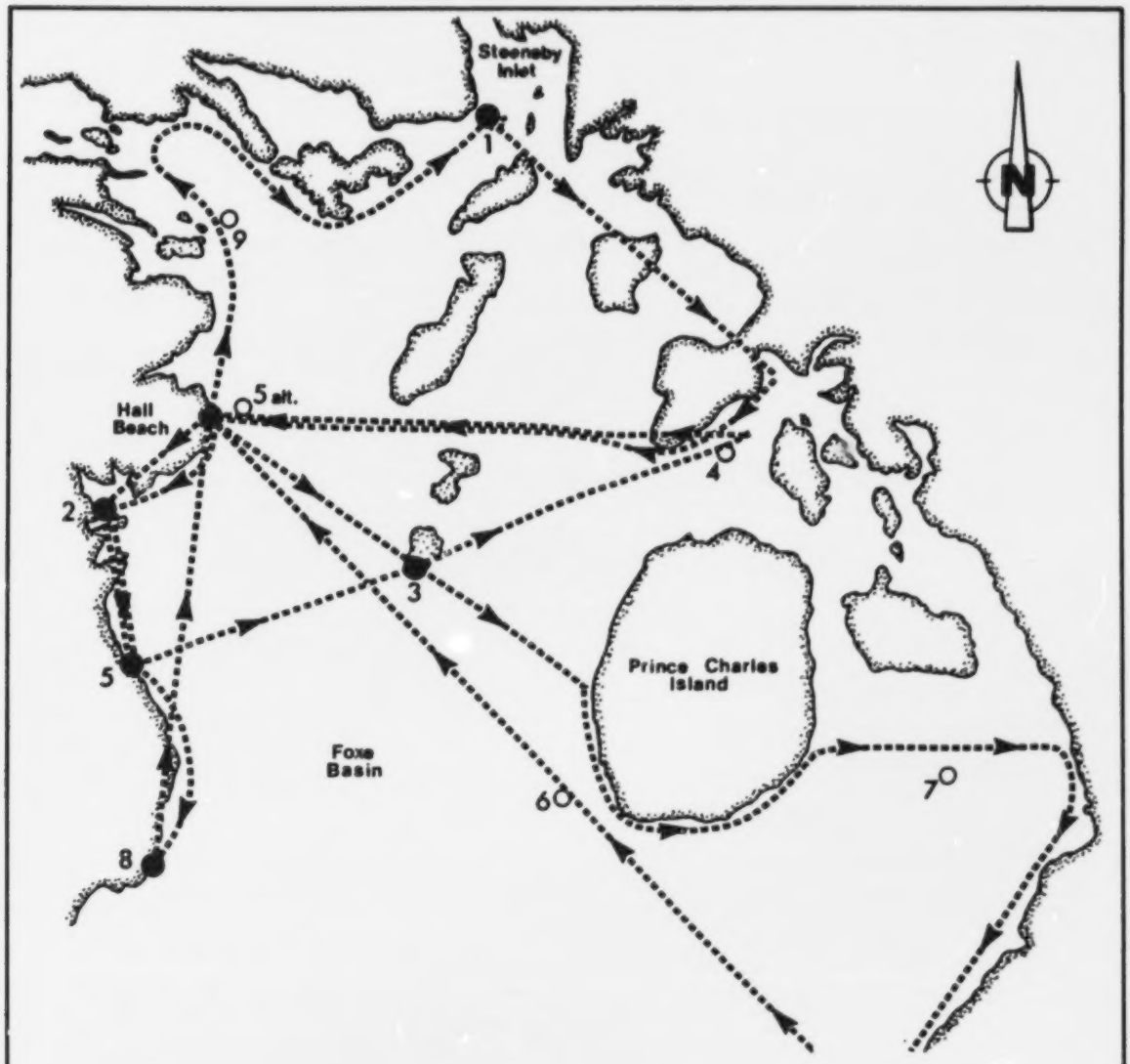
Prepared for:

Department of Fisheries and Oceans
Bedford Institute of Oceanography
P.O. Box 1006
Dartmouth, Nova Scotia
B2Y 4A2

Prepared by:

Dobrocky SEATECH Limited
Suite 48, 1000 Windmill Road
Dartmouth, Nova Scotia
B3B 1L7
Telephone: (709) 463-4099
Telex: 019-31691

Our Reference No.: 3-010



DEPLOYMENT & ICE RECONNAISANCE
February 1984 Fight Paths

----- Flight Paths Including Reconnaisance
● Sites where Instruments were Deployed
○ Sites where Deployment of Instruments was impracticable

1. SUMMARY

The following is a summary of field activities during the period February 15 to March 1, 1984. This report details the deployment of five Aanderaa tide recorders and two arctic-modified Aanderaa current meters around the perimeter of Foxe Basin, N.W.T.

The deployment of the tide gauges were performed for the Canadian Hydrographic Service, Mr. Stephen Grant, Scientific Authority, while the current meters were deployed for the Ocean Circulation Division, B.I.O., Dr. Simon Prinsenberg, Scientific Authority.

2. FIELD ACTIVITIES

February 15, 1984

Senior technician M. Hill of Dobrocky SEATECH Ltd. travel from Victoria to Halifax.

February 16, 1984

- M. Hill meets with S. Grant at B.I.O. to discuss deployment sites for tide recorders and with S. Prinsenberg for the current meter sites.
- M. Hill meets with Peter McGinn to discuss individual instruments.
- M. Hill picks up instruments from B.I.O. and transports them to SEATECH's facilities in Dartmouth, Nova Scotia.
- M. Hill makes arrangements for shipment of instruments from Halifax to Hall Beach via Air Canada and Nordair.

February 17, 1984

- Assistant field technician J. Walpert, Dobrocky SEATECH Ltd. travels from St. John's Newfoundland to meet with M. Hill in Halifax.
- M. Hill and Walpert discuss project in detail.

1300 - J. Walpert travels from Halifax to Montreal.
- M. Hill ships all tide recorders to Montreal via Air Canada.

1845 - M. Hill travels down from Halifax to Montreal.

2020 - M. Hill arrives in Montreal, locates tide recorders and transfers them to Nordair for shipment to Hall Beach.

February 18, 1984

0900 - M. Hill and J. Walpert leave Montreal for Hall Beach.

1425 - Arrive at Hall Beach, locate and unpack all equipment.

1900 - Bradley Air Services twin otter C-GNDN arrives.
- Unpack instrumentation and begin preparation of tide gauges.

February 19, 1984

- Initialize all tide recorders (as indicated on the deployment sheets in Appendix).
- Initialize all current meters (as indicated on the deployment sheets).
- Prepare all tools for work on ice.
- Bradley Air Services installs skis and positioning system on Twin Otter.
- Discuss project with pilot Karl Z'berg and co-pilot Norman Charlebois.

February 20, 1984

- Load aircraft.
0839 - Leave Hall Beach for site #2.
- Poor visibility prevents landing at site #2.
0900 - Travel to site #5.
0918 - Poor visibility prevents landing at site #5.
- Travel to site #3.
1004 - Land at site #3.
- Drill hole and measure ice thickness and water depth.
1052 - Deploy Aanderaa TG 3A#224.
1116 - Leave site #3 for site #4.
1209 - Arrive at site #4.
- Drill hole approximately 100 metres offshore into sand bottom.
- Drill second hole 100 metres farther offshore, again into sand.
- Attempt to locate alternate deployment site. Unsuccessful due to open water and unstable ice conditions.
1542 - Abandon site #4. Leave for Hall Beach.
1642 - Arrive at Hall Beach.

February 21, 1984

0800 - Load aircraft.
0853 - Leave Hall beach for site #2.
0929 - Land at site #2.
- Power auger malfunctions.

1024 - Leave site #2 for Hall Beach to repair auger.
1048 - Arrive at Hall Beach and repair auger.
1223 - Leave Hall Beach for site #2.
1310 - Deploy Aanderaa WLR#380 at site #2.
1320 - Leave site #2 for site #5.
1353 - Arrive at site #5.
1410 - Deploy Aanderaa TG3A #216.
1505 - Install and measure sea elevations to bench marks #1 and #2.
1514 - Leave site #5 for site #8.
1553 - Arrive at site #8.
1620 - Deploy Aanderaa RCM4 #2772.
1625 - Deploy Aanderaa WLR#336.
1715 - Install and measure sea elevations to bench mark.
1728 - Leave site #8 for Hall Beach.
1825 - Arrive at Hall Beach.

February 22, 1984

0800 - Load aircraft.
0916 - Leave Hall Beach for site #1.
1022 - Arrive at site #1.
1118 - Auger malfunctions, return to Hall Beach.
1211 - Arrive at Hall Beach and repair auger.
- Aircraft C-GNDN taken off program to attend to DEW line duties.

February 23, 1984

- Standby at Hall Beach; aircraft C-GNDN on DEW line duties all day.

February 24, 1984

- Standby at Hall Beach; aircraft C-GNDN on DEW line duties all day.

February 25, 1984

0730 - Load aircraft.
0836 - Leave Hall Beach for site #6.
0930 - Arrive at proposed location of site #6 and look for suitable landing site.
- Fly southwards around Prince Charles Island.
1010 - Abandon search for site #6 (no landing sites available); fly to site #7.
- search for landing area on south shore of Foxe Basin.
1120 - Abandon search for site #7 due to ice conditions leave for Hall Beach.
1308 - Arrive at Hall Beach for fuel.
1335 - Leave Hall Beach for site #9.
- Fly over Fury and Hecla Strait (site #9) in search of landing site.
- Abandon search for site #9 at eastern end of Fury and Hecla Strait due to open water.
1430 - Arrive at site #1.
1436 - Land at site #1.
1455 - Deploy Aanderaa TG3A #199.
1500 - Deploy Aanderaa RCM4 #2775.
1509 - Leave Hall Beach for site #4.
- Fly along south coast of Baird Peninsula from Longstaff Bluff to Cape Burpee.
1606 - Abandon site #4.
- Leave for Hall Beach.
1702 - Arrive at Hall Beach.

February 26, 1984

- Pack all unused instrumentation for shipment south.

February 27, 1984

- Standby for southbound.

February 28, 1984

- Standby for southbound.

February 29, 1984

- Standby for southbound
1715 - Depart Hall Beach.
2355 - Arrive in Montreal.

March 01, 1984

0730 - Hill departs Montreal for Victoria.

3. DESCRIPTION OF ICE CONDITIONS

The accompanying overlays portray the route flown during the course of instrument deployments. Approximately 19 hours of flying time were consumed in the deployment and reconnaisance of the eastern shore. Sixteen observations of walruses, in particular, and to a lesser extent, polar bears are indicative of the presence of open water.

The predominant ice type observed was brash or rubble ice: chunks of ice of about 1 m characteristic size. Brash ice is formed through the fracture of ice floes by wind and strong currents. All of Foxe Basin, with the exception of Steensby Inlet (Site 1) has unstable ice conditions well after freezeup. Shore fast ice is confined to sheltered bays where the water depth exceeds the tidal range.

On the eastern shores (sites 6 and 7) the ice surface is very rough. The pack is active and leads are generally oriented east-west. It would not have been useful to deploy ice tethered instruments in these areas since there would have been virtually no possibility of recovering them. Landing safely, too, would have been problematical.

An attempt to deploy a tide gauge at site 4 revealed that the ice was bottom fast. Furthermore, no apparent tide cracks were observed. This location may well have been over extensive shallows where ice accretion occurs episodically with the ebbing of each high tide. The ice in such a region may be afloat only at times of spring high tides.

In the region of the Spicer Islands, the ice is active and ice cover can be as little as 5/10. A shore fast strip of ice perhaps one mile wide was present separated from the moving pack by a lead.

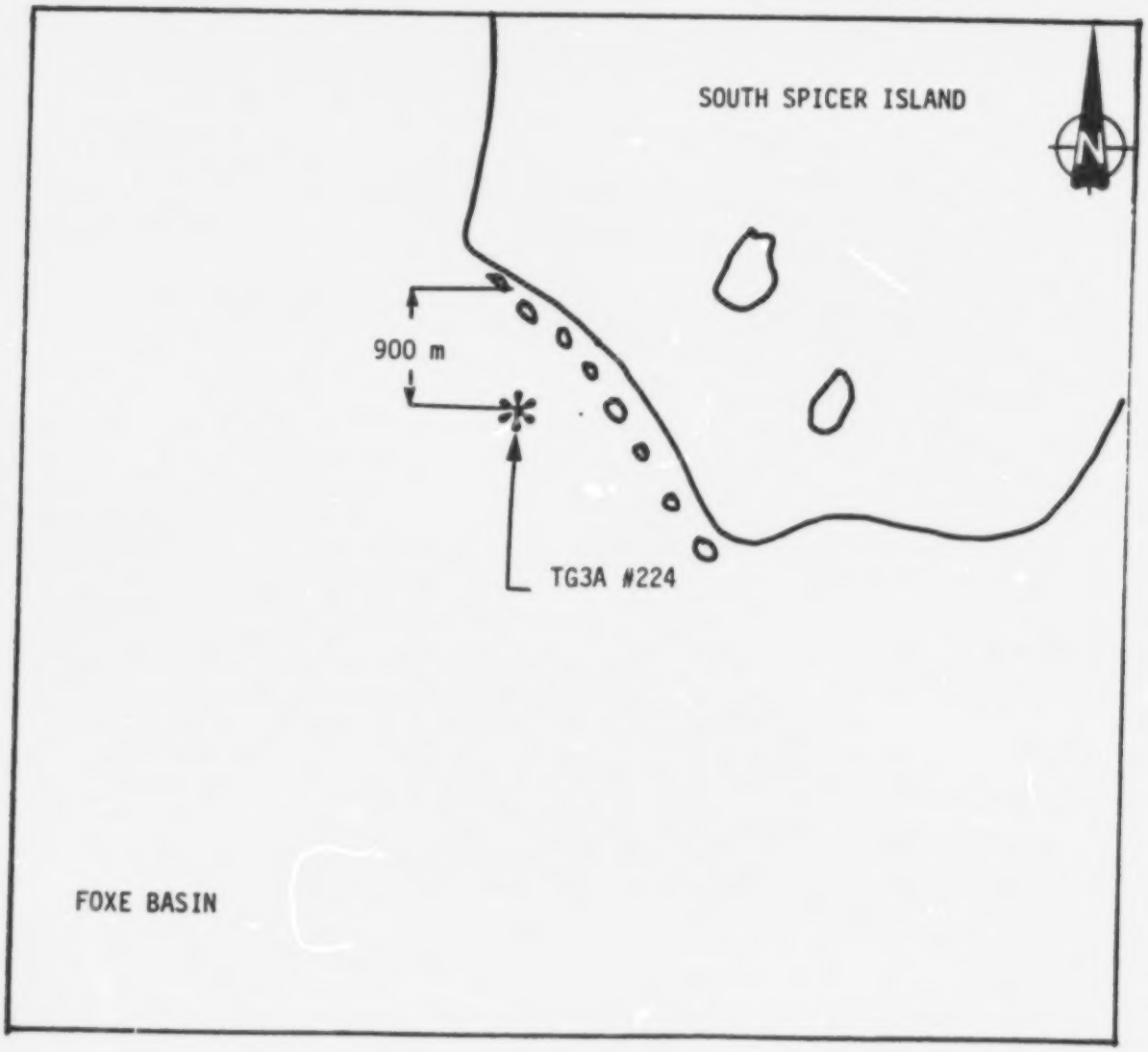
The eastern end of Fury and Hecla Strait was characterized by extensive areas of new and young ice (grey) and areas of 2/10 ice concentration. No landings were contemplated in this regime after a cursory examination. It is very probable that strong tidal currents in this area provide enough sensible heat flux through the ocean-air interface to subdue ice growth.

The terrestrial topography of the western shore is varied and is reflected in the sub-sea topography, the currents and ice conditions. In the immediate vicinity of Hall Beach, the shore is quite featureless, shallows extend many miles offshore and the ice is rough and broken. Further south, in the region of Cape Wilson (site 8) a dramatic change occurs. The shoreline is characterized by granite cliffs and the ice is mobile. Leads parallel the shoreline and the intensely deformed ice between the leads suggests the presence of a strong horizontal shear in the currents.

According to the Pilot of Arctic Canada, the tide range in foxe Basin is 7 m near Foxe Channel and 2 m in the northern regime. Such a trend in tidal heights indicates that most of the tidal energy is being dissipated within the system through the agency of strong currents and friction. Unstable ice conditions should, therefore, be expected and were of course, encountered. Some of the local residents suggest that the ice pack stabilizes toward the end of April. This could be due to continuing ice growth, slightly lower mean tidal range in March and April and to abate next of storms.

Site Descriptions

Site Name	Foxe Basin Site # 3
Latitude	68° 12.1'
Longitude	79° 05.2'
Ice Thickness	1.20 m
Water Depth	3.7 m
Instrument #	TG3A # 224 deployed at 1552 20 Feb. 84.



TG 3A DEPLOYMENT SHEET

PROJECT NUMBER: 3-010

INSTRUMENT #: 224

TAPE #: 224/1

LOCATION:

Site Name or #: Foxe Basin Site # 3

Latitude: 68° 12.1' Longitude: 79° 05.2'

Approximate depth: 3.7 m

INSTRUMENT:

Pressure sensor #: 304 range: 0 → 270 m

Temperature sensor #: 191 range: -5°C → 35°C

Preparation date: 18 Feb. 84 by: M. Hill

Test tape date: n/a tape #:

Latest calibration date: 17 Jan. 84

TIMING DATA:

Deployment: Time Zone: GMT or GMT + 0 hrs.

Sampling Interval: 30 min.

Batteries connected: 1505 19 Feb. 84

Clock reset: 1514:32 19 Feb. 84

First sample: 1530:00 19 Feb. 84

Second sample: 1600:00 19 Feb. 84

Deployed at: 1552:00 20 Feb. 84

Deployed by: M. Hill, J. Walpert

Notes:

Recovery: Time Zone: or GMT + hrs.

Recovered at:

Recovered by:

Last sample:

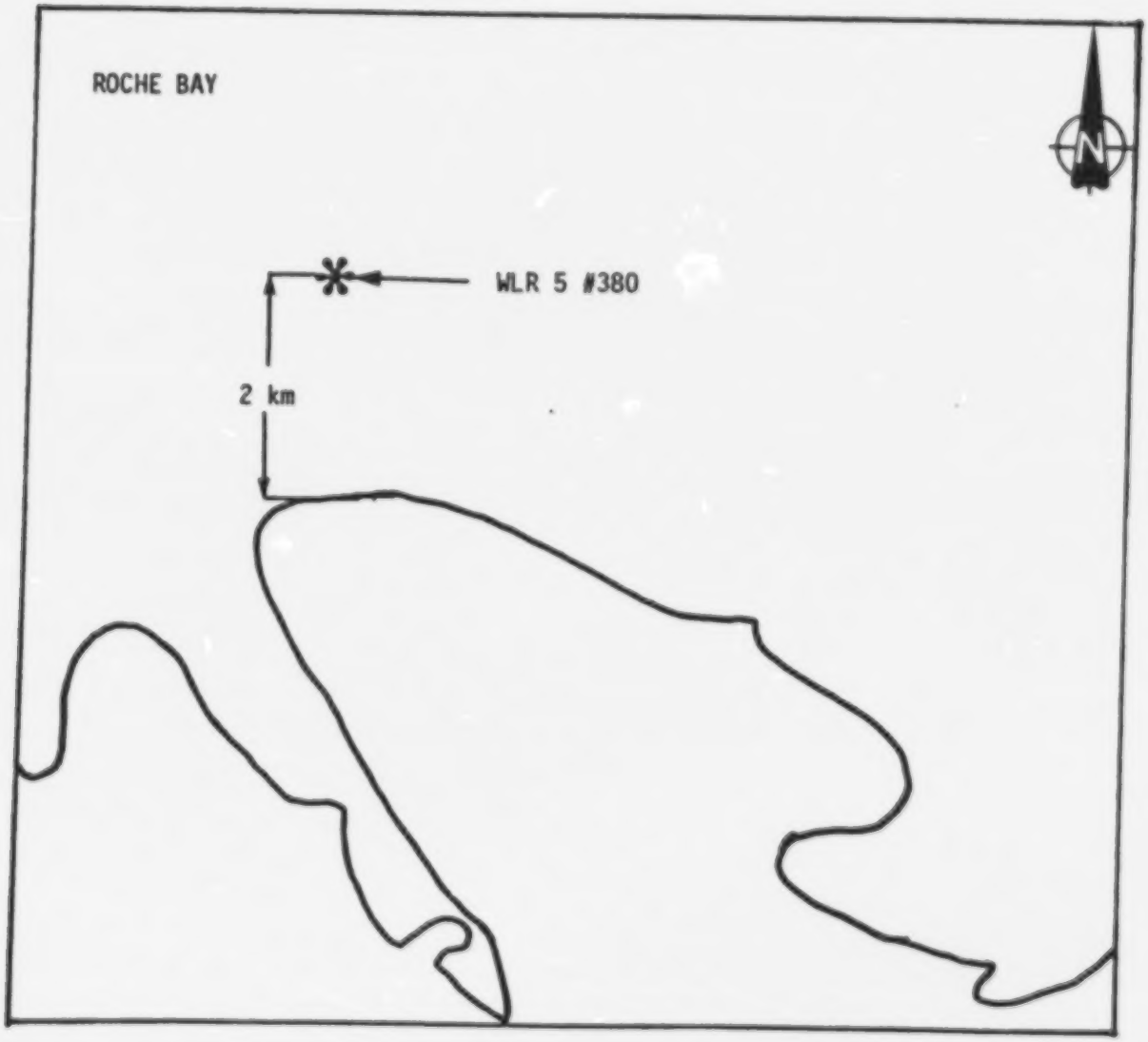
Notes:

Batteries: Deployment: vdc vdc vdc

Recovery: vdc vdc vdc

Site Descriptions

Site Name Foxe Basin Site #2
Latitude 68° 23.5'
Longitude 82° 08.9'
Ice Thickness 1.55 m
Water Depth 9.5 m
Instrument # WLR 5 #380 deployed at 1810, 21 Feb. 84



WLR 5
with Electronics Board Model # 5090
DEPLOYMENT SHEET

PROJECT NUMBER: 3-010
INSTRUMENT #: 380
INSTRUMENT REF. #: 0129
TAPE #: 380/1
OF CHANNELS: 5

LOCATION

Site Name or #: Foxe Basin Site #2
Latitude: 68° 23.5' Longitude: 82° 08.9'
Approximate depth: 9.5 m

INSTRUMENT

Pressure sensor #: 380 range: 0 → 270 m
Temperature installed #: 1 range: -2°C → 22°C
Preparation date: 18 Feb. 84 by: M. Hill
Test tape date: n/a tape #:
Latest calibration date: 17 Jan. 84

TIMING DATA:

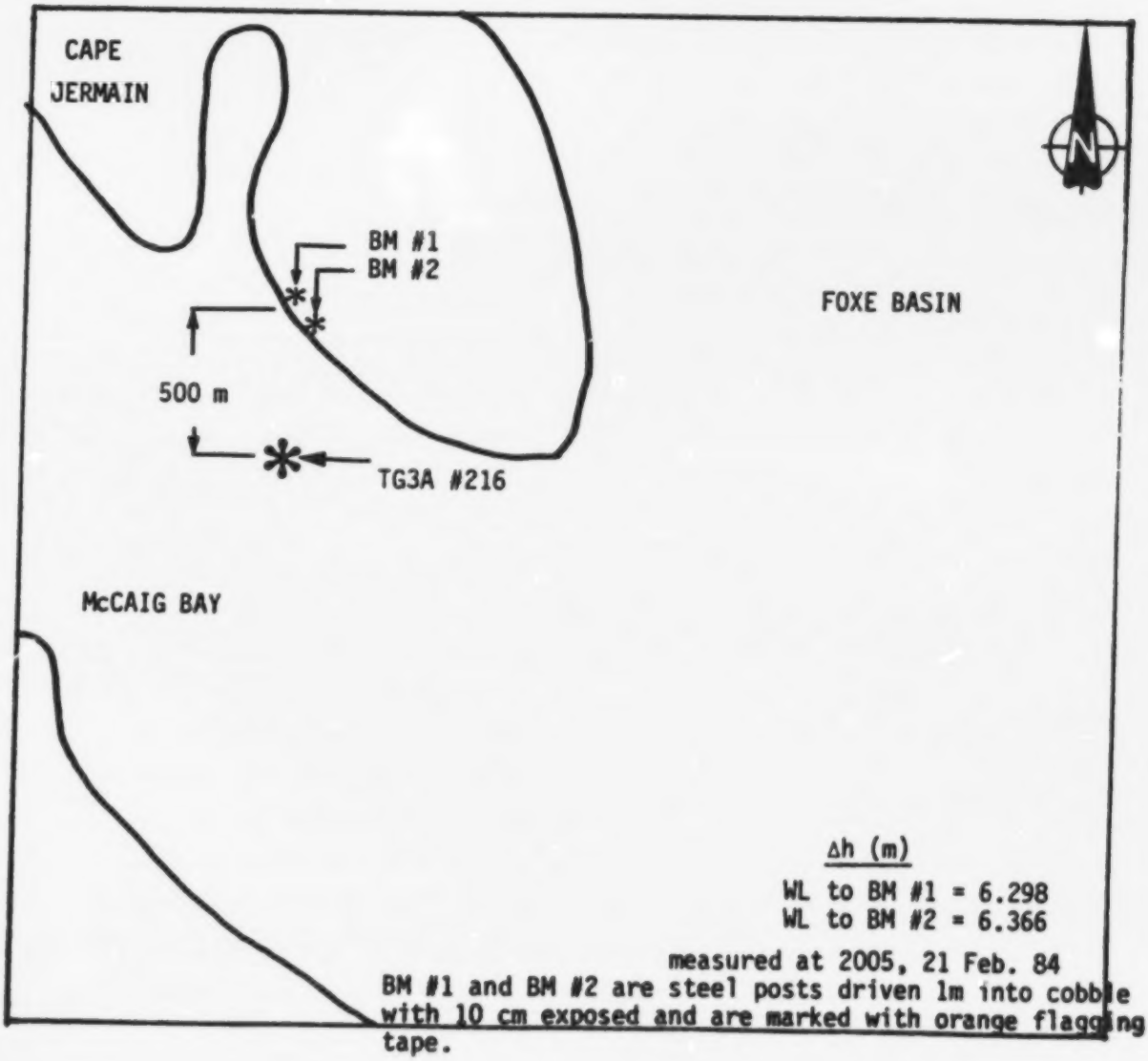
Deployment: Time Zone: GMT or GMT + 0 hrs.
Sampling Interval: 30 min.
Integration Time: Pressure: 56 sec. Temperature: 56 sec.
Clock reset: 1544:04 . 19 Feb. 84
First sample: 1545:00 19 Feb. 84
Second sample: 1615:00 19 Feb. 84
Deployed at: 1810:00 21 Feb. 84
Deployed by: M. Hill, J. Walpert
Notes:

Recovery: Time Zone: or GMT + hrs.
Recovered at:
Recovered by:
Last sample:
Notes:

Batteries: Deployment: vdc vdc vdc
Recovery: vdc vdc vdc

Site Descriptions

Site Name: Foxe Basin Site #5
Latitude: 67° 46.4'
Longitude: 81° 45.6'
Ice Thickness: 1.60 m
Water Depth: 21.9 m
Instrument #: TG3A #216 deployed at 1910, 21 Feb. 84



Δh (m)

WL to BM #1 = 6.298
WL to BM #2 = 6.366

measured at 2005, 21 Feb. 84

BM #1 and BM #2 are steel posts driven 1m into cobble with 10 cm exposed and are marked with orange flagging tape.

TG 3A DEPLOYMENT SHEET

PROJECT NUMBER: 3-010

INSTRUMENT #: 216

TAPE #: 216/1

LOCATION:

Site Name or #: Foxe Basin Site #5

Latitude: 67° 46.4' Longitude: 81° 45.6'

Approximate depth: 21.9 m

INSTRUMENT:

Pressure sensor #: 216 range: 0 → 270 m

Temperature sensor #: 190 range: -5°C→ 35°C

Preparation date: 18 Feb. 84 by: M. Hill

Test tape date: n/a tape #:

Latest calibration date: 17 Jan. 84

TIMING DATA:

Deployment: Time Zone: GMT or GMT + 0 hrs.

Sampling Interval: 30 min.

Batteries connected: 1505 19 Feb. 84

Clock reset: 1514:32 19 Feb. 84

First sample: 1515:00 19 Feb. 84

Second sample: 1530:00 19 Feb. 84

Deployed at: 1910:00 21 Feb. 84

Deployed by: M. Hill, J. Walpert

Notes: Water level to BM #1 and BM #2 measured at 2005, 21 Feb. 84

Δh(m) to BM #1 = 6.298 m Δh(m) to BM #2 = 6.366 m

Recovery: Time Zone: or GMT + hrs.

Recovered at:

Recovered by:

Last sample:

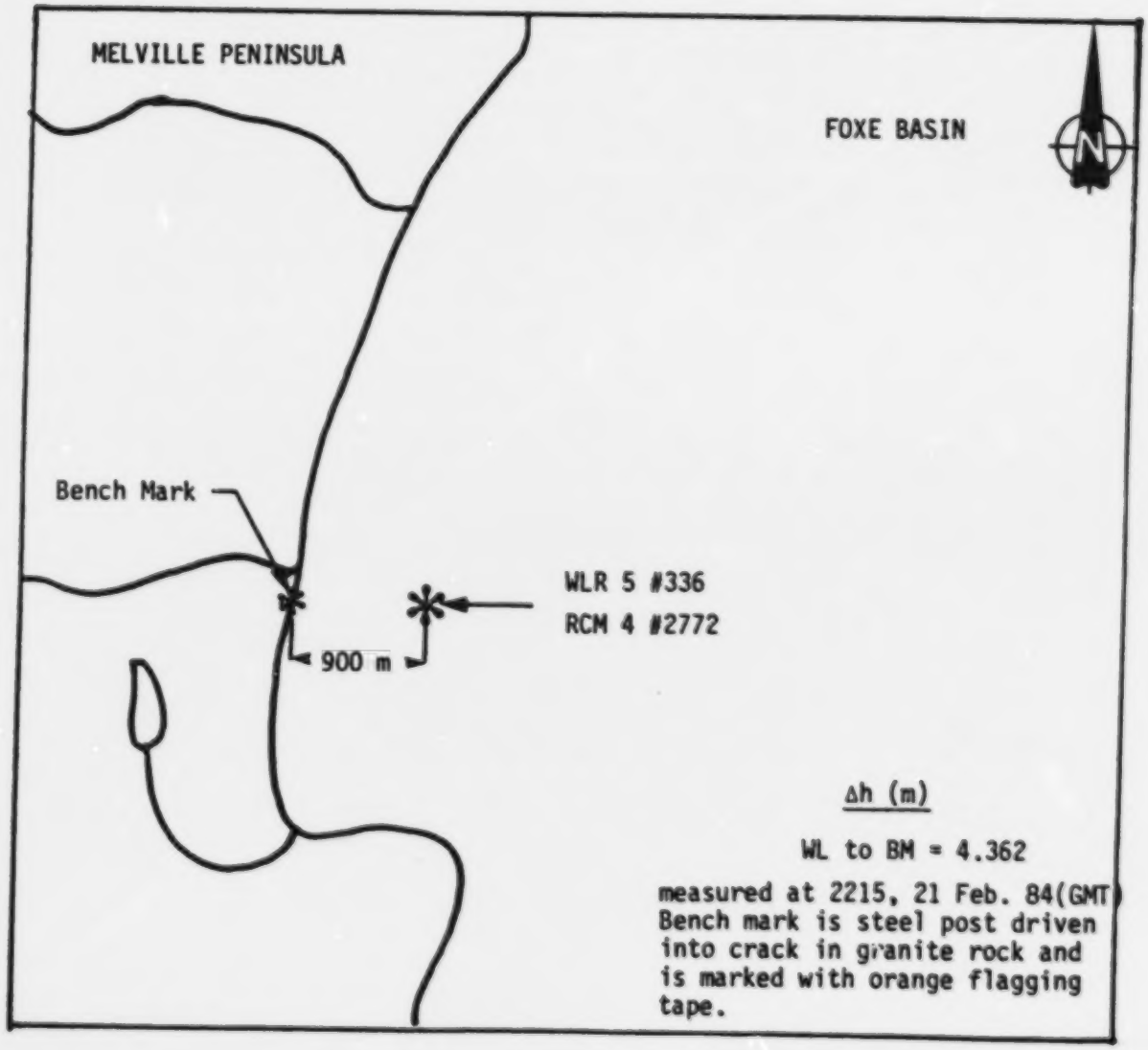
Notes:

Batteries:

Deployment:	10.07	vdc	n/a	vdc	n/a	vdc
Recovery:		vdc		vdc		vdc

Site Descriptions

Site Name	Foxe Basin Site #8
Latitude	67° 06.3'
Longitude	81° 22.9'
Ice Thickness	1.60 m
Water Depth	37.1 m
Instrument #	WLR 5 #336 deployed at 2125, 21 Feb. 84
	RCM4 #2772 deployed at 2120, 21 Feb. 84


MELVILLE PENINSULA
FOXE BASIN
N
Bench Mark
WLR 5 #336
RCM 4 #2772
900 m
Δh (m)
WL to BM = 4.362
measured at 2215, 21 Feb. 84(GMT)
Bench mark is steel post driven into crack in granite rock and is marked with orange flagging tape.

Instrument Deployment

Project Number: 3-010

GEOREF: Lat. 67° 06.3' Long. 81° 22.9'

Magnetic Correction: oriented to True North

Site Name or Number Foxe Basin Site # 8

INSTRUMENT:

Instrument #: 2772 Instrument Type: RCM4 Arctic

Instrument Ref. #: 0579 Tape Ref. #: 2772/20

Preparation Date: 04 Feb. 84 By: M. Hill

ACOUSTIC RELEASE:

Type: n/a

Model #: Serial #:

Rearm Code: Release Code:

ATTACHMENTS:

Conductivity Cell #: 2105 #7326

Pressure Poten. #: 50674-31 Range: disconnected

Thermistor Response: slow Range: -2.46°C → 21.48°C

Rotor Counter: ↑ 4 Compass #: 11879

Others: AMS TCG on channel #4 (pressure)

set to increment 1 bit every 64 seconds

BATTERIES:

Main: 10.09 vdc Aux. #1 10.07 vdc

Aux. #2: n/a vdc Clock: 4.05 vdc

TIME DATA/Deployment:

Time Zone: GMT or GMT ± 0 hrs.

Batteries Connected: 1815 19 Feb. 84 Clock Reset: 1845 19 Feb. 84

Time Interval: 15 min. First Cycle: 1857 19 Feb. 84

Time Deployed: 2120 21 Feb. 84 First Pertinent Data: 2157 21 Feb. 84

Deployed By: M. Hill, J. Walpert

TIME DATA/Recovery:

Time Zone: or GMT ± hrs.

Released At: Last Pertinent Data:

Last Cycle: Shut Off:

WLR 5
with Electronics Board Model # 2898
DEPLOYMENT SHEET

PROJECT NUMBER: 3-010
INSTRUMENT #: 336
INSTRUMENT REF. #: 0573
TAPE #: 336/1

LOCATION

Site Name or #: Foxe Basin Site # 8
Latitude: 67° 06.3' Longitude: 81° 22.9'
Approximate depth: 37.1 m

INSTRUMENT

Pressure sensor #: 336/12931 range: 0 → 270 m
Temperature installed #: yes range: -3°C → 35°C
Preparation date: 18 Feb. 84 by: M. Hill
Test tape date: n/a tape #:
Latest calibration date: 17 Jan. 84

TIMING DATA:

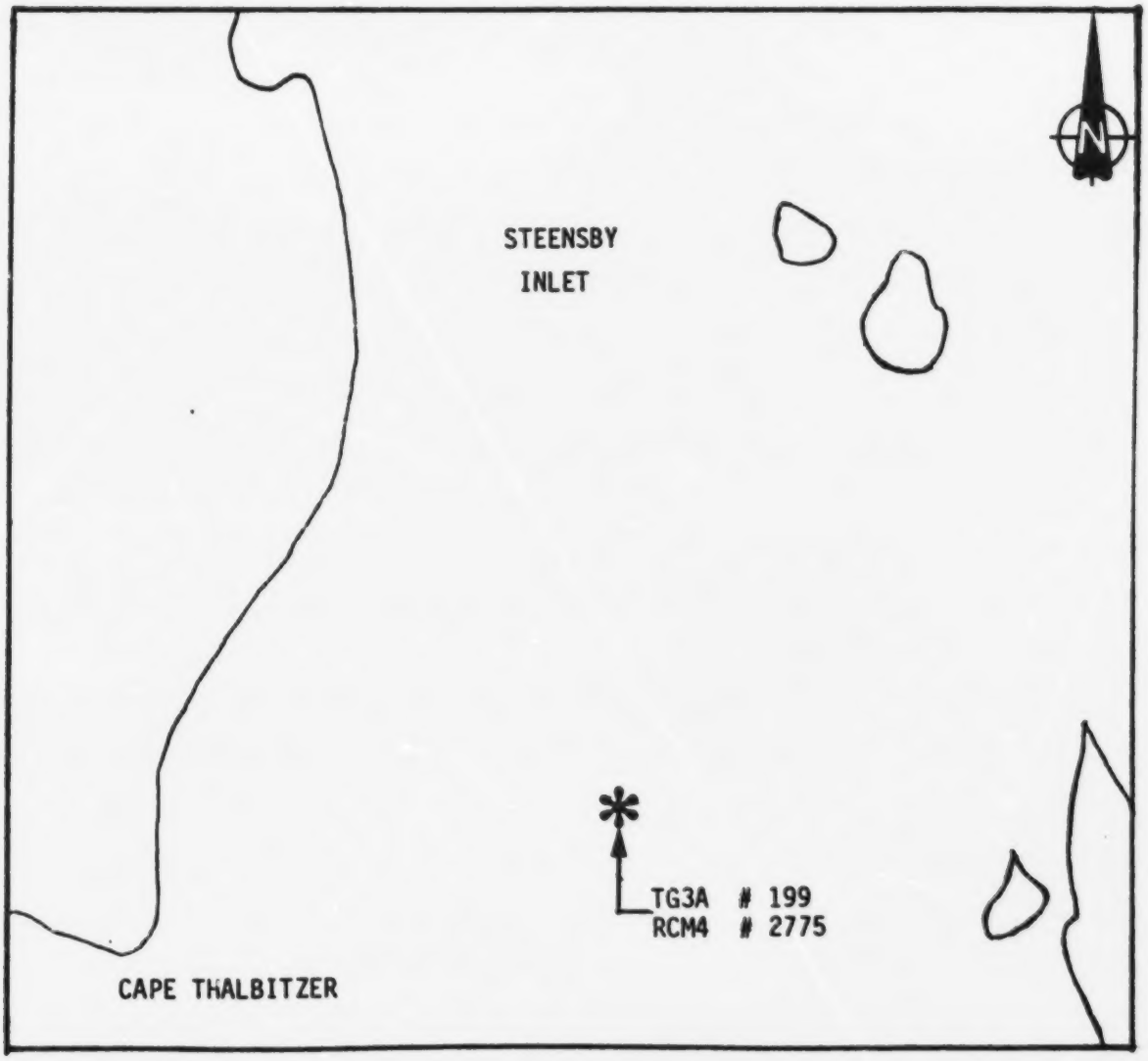
Deployment: Time Zone: GMT or GMT + 0 hrs.
Sampling Interval: 30 min.
Batteries connected: 1530:00 19 Feb. 84
Clock reset (manual reset): 15:44:20 19 Feb. 84
First sample: 1545:00 19 Feb. 84
Second sample: 1615:00 19 Feb. 84
Deployed at: 2125:00 21 Feb. 84
Deployed by: M. Hill, J. Walpert
Notes: WL to BM measured at 2215, 21 Feb. 84
Δh (m) = 4.362

Recovery: Time Zone: or GMT + hrs.
Recovered at:
Recovered by:
Last sample:
Notes:

Batteries: Deployment: vdc vdc vdc
Recovery: vdc vdc vdc

Site Descriptions

Site Name	Foxe Basin Site #1
Latitude	69° 51.6'
Longitude	78° 29.8'
Ice Thickness	1.64 m
Water Depth	39.9 m
Instrument #	TG3A #199 deployed at 1955, 25 Feb. 84
	RCM4 #2775 deployed at 2000, 25 Feb. 84.



Instrument Deployment

Project Number: 3-010

GEOREF: Lat. 69° 51.6' Long. 78° 29.8'

Magnetic Correction: Orriented to 305° True

Site Name or Number Foxe Basin Site #1

INSTRUMENT:

Instrument #: 2775 Instrument Type: RCM4 Arctic

Instrument Ref. #: 0672 Tape Ref. #: 2775/17

Preparation Date: 04 Feb. 84 By: M. Hill

ACOUSTIC RELEASE:

Type: n/a

Model #: Serial #:

Rearm Code: Release Code:

ATTACHMENTS:

Conductivity Cell #: 2105 #7030

Pressure Poten. #: n/a Range:

Thermistor Response: slow Range: -2.46°C → 21.48°C

Rotor Counter: + 4 Compass #: 11817

Others: A.M.S. TCG on channel #4

set to increment 1 bit every 64 seconds

BATTERIES:

Main: 10.05 vdc Aux. #1 10.08 vdc

Aux. #2: n/a vdc Clock: 4.06 vdc

TIME DATA/Deployment:

Time Zone: GMT or GMT ± 0 hrs.

Batteries Connected: 1815 19 Feb. 84 Clock Reset: 1845 19 Feb. 84

Time Interval: 15 min. First Cycle: 1852 19 Feb. 84

Time Deployed: 2000 25 Feb. 84 First Pertinent Data: 2052 25 Feb. 84

Deployed By: M. Hill, J. Walpert

TIME DATA/Recovery:

Time Zone: or GMT ± hrs.

Released At: Last Pertinent Data:

Last Cycle: Shut Off:

TG 3A DEPLOYMENT SHEET

PROJECT NUMBER: 3-010

INSTRUMENT #: 199

TAPE #: 199/1

LOCATION:

Site Name or #: Foxe Basin Site # 1

Latitude: 69° 51.6' Longitude: 78° 29.8'

Approximate depth: 39.9 m

INSTRUMENT:

Pressure sensor #: 199 range: 0 → 270 m

Temperature sensor #: 162 range: -5°C → 35°C

Preparation date: 18 Feb. 84 by: M. Hill

Test tape date: n/a tape #:

Latest calibration date: 17 Jan. 84

TIMING DATA:

Deployment: Time Zone: GMT or GMT + 0 hrs.

Sampling Interval: 30 min.

Batteries connected: 1505 19 Feb. 84

Clock reset: 1514:32 19 Feb. 84

First sample: 1515:00 19 Feb. 84

Second sample: 1530:00 19 Feb. 84

Deployed at: 1955:00 25 Feb. 84

Deployed by: M. Hill, J. Walpert

Notes:

Recovery: Time Zone: or GMT + hrs.

Recovered at:

Recovered by:

Last sample:

Notes:

Batteries: Deployment: vdc vdc vdc

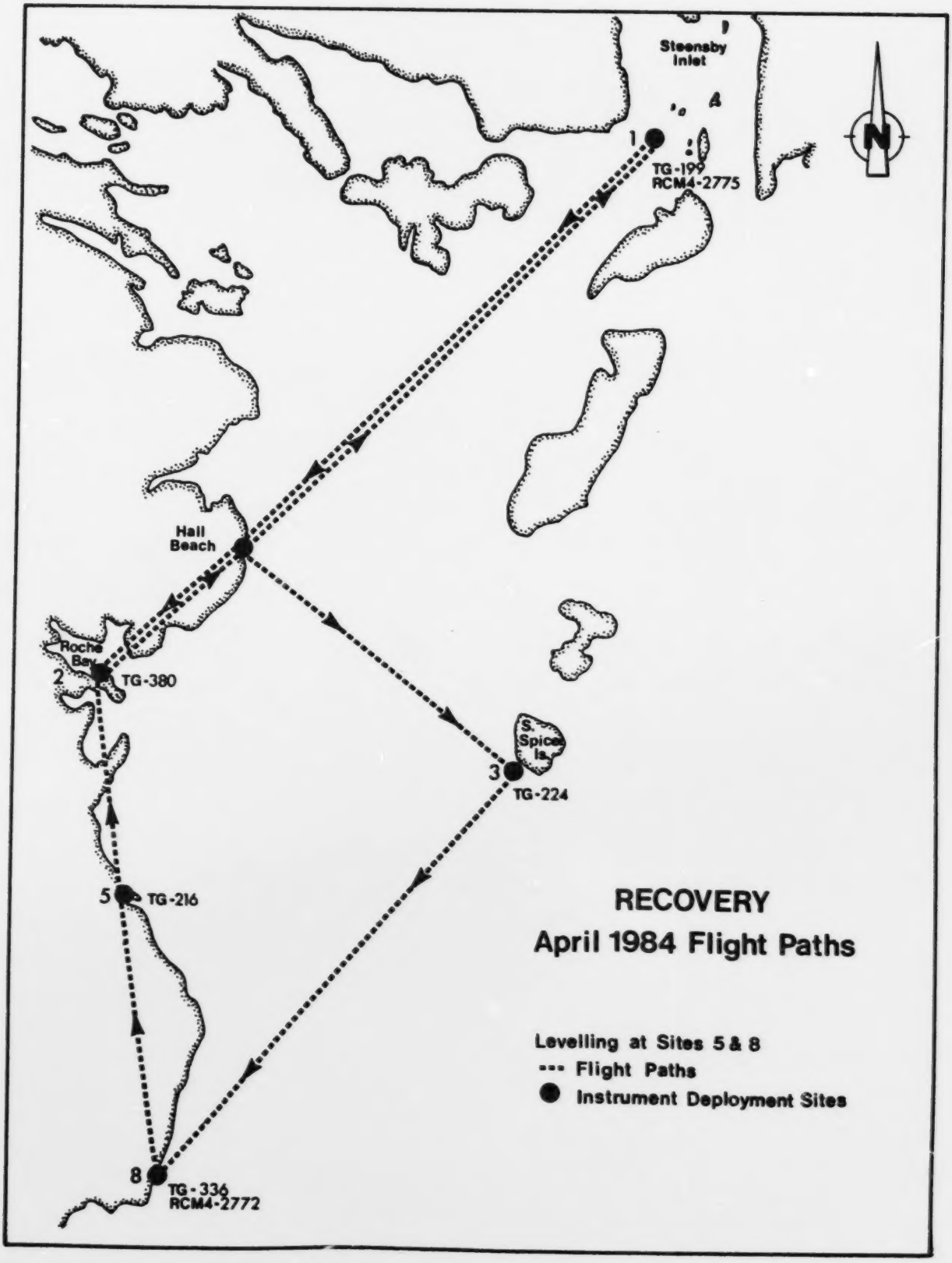
Recovery: vdc vdc vdc

APPENDIX II

April, 1984

REPORT

TIDAL PROPAGATION MEASUREMENTS IN THE FOXE BASIN, N.W.T.
FIELD OPERATIONS DURING APRIL, 1984


Steensby Inlet
1
TG-199
RCM4-2775
N
Hall Beach
Roche Bay
2
TG-380
S. Spicer Is.
3
TG-224
5
TG-216
8
TG-336
RCM4-2772
RECOVERY
April 1984 Flight Paths
Levelling at Sites 5 & 8
--- Flight Paths
● Instrument Deployment Sites

FIELD REPORT, FOXE BASIN APRIL 1984

The following report details the activities of Dobrocky SEATECH field personnel during an instrument recovery trip from April 3, 1984 to April 15, 1984. The purpose of the trip was the recovery of oceanographic instruments deployed during February 1984 in support of the Bedford Institute's 1984 Foxe Basin Tidal Study. All times are local standard time in this narrative.

April 3, 1984

1245 - Mark Hill departed Victoria.
2300 - Arrived in Montreal.

April 4, 1984

1030 - Departed Montreal.
1630 - Arrived in Hall Beach.
- Located field equipment.
- Discussed aircraft requirements with Ross Michelen and Roger Juneau of First Air.

April 5, 1984

- Unpacked and tested recovery equipment.
- Briefed aircrew about landing sites.

April 6, 1984

1030 - Loaded First Air DeHavilland Twin Otter #C-FASS with all recovery equipment.
1054 - Off Hall Beach for Station #3 off the southern tip of South Spicer Island.
1145 - Locate and land at Station #3.
1215 - Drilled hole through 2m of ice.
1221 - Recover Aanderaa Tide Guage #224.
1225 - Pack aircraft.
1234 - Off Station #3 for Station #8 on the western shoreline of Foxe Basin north of Cape Wilson.
1318 - Arrived at Station #8.
1350 - Measured water level to bench mark which had been established on February 21, 1984.
1403 - Drilled hole through 2m of ice.

FOXE BASIN APRIL 1984

Page 2

April 6, 1984 cont'd

1408 - Recovered Aanderaa Water Level Recorder #336.
1430 - Drilled second hole through 2m of ice.
1445 - Release Aanderaa RCM4 #2772
1502 - Recovered Aanderaa RCM4 #2772.
- Packed aircraft.
1519 - Off Station #8 for Station #5 on the western shore of Foxe Basin on the inside of McCaig Bay.
1546 - Arrived at Station #5.
- Set up to measure water level.
1630 - Drilled hole through 2m of ice.
1635 - Measured water level from 2 bench marks installed on February 21, 1984.
- Recovered Aanderaa Tide Guage #216.
- Packed aircraft.
1645 - Off Station #5 for Station #2 south of Hall Beach in Roche Bay.
1705 - In area of Station #2 searching for surface marker.
- Unable to locate surface marker.
1735 - Aircraft C-FASS low on fuel. Return to Hall Beach.
1755 - Arrived at Hall Beach.
1900 - Cleaned all instrumentation.
2054 - Last cycle for WLR5 #336.
2100 - Last cycle for TG3A #216.
2101 - Last cycle for TG3A #224.
2114 - Last cycle for RCM4 #2772.

April 7, 1984

0800 - Repaired nose ski on aircraft C-FASS.
- Load recovery equipment on aircraft.
0850 - off Hall Beach for Station #1 east of Cape Thalbitzer at the entrance to Steensby Inlet.
0940 - Arrived at Station #1.
0945 - Drilled hole through 2m of ice.
0958 - Recovered Aanderaa Tide Guage 3A #199.
1010 - Drilled second hole through 2m of ice.
1016 - Released Aanderaa current meter RCM4 #2775.
- Packed aircraft.
1030 - Off Station #1 for Hall Beach.

FOXE BASIN APRIL 1984

Page 3

April 7, 1984 cont'd

1115 - Arrived at Hall Beach.
- Aircraft C-FASS off Hall Beach for normally scheduled flights between Igloolik and Hall Beach.
1215 - Cleaned all instrumentation.
1253 - Last cycle for Aanderaa RCM4 #2775.
1300 - Last cycle for Aanderaa Tide Guage 3A #199.
- Packed all instrumentation.

April 8, 1984

- Aircraft C-FASS off Hall Beach on normally scheduled flights.
1245 - Load aircraft with recovery equipment.
1256 - Depart Hall Beach for Station #2 in Roche Bay.
1325 - Near Station #2 searching for surface marker.
1401 - Located Station #2.
1408 - Landed at Station #2.
1415 - Drilled hole through 2.3m of ice.
1418 - Recovered Aanderaa Water Level Recorder #5, #380.
- Packed aircraft.
1426 - Off Station #2 for Hall Beach.
1447 - Arrived at Hall Beach.
1510 - Cleaned instrumentation.
1520 - Last cycle for Aanderaa Water Level Recorder #5, #380.
- Packed shipping crates.

April 9, 1984

- Made arrangements for shipments south.
- Delivered all equipment to Nordair, Hall Beach.

April 10, 1984

- Storm conditions.
- Weather bound.

April 11, 1984

- Storm conditions.
- Departure flight cancelled until April 14, 1984.

FOXE BASIN APRIL 1984

Page 4

April 12, 1984

- Storm conditions.
- Weather bound.

April 13, 1984

- Storm conditions.
- Weather bound.

April 14, 1984

- Storm abated.

1800 - Depart Hall Beach for Montreal.

April 15, 1984

0100 - Arrived in Montreal.
1350 - Depart Montreal for Halifax.
1630 - Arrived in Halifax.

April 17, 1984

0830 - Met with Stephen Grant (BIO) and Peter McGinn (BIO) and discussed field logistics.

TECHNICAL OBSERVATIONS, FOXE BASIN APRIL 1984

Following are a few personal observations of the DS tech staff made during the deployment and recovery operations of this field program. Some observations are logistical in nature and should be considered for planning field operations in this area in future. Environmental observations are also included to provide an insight into local (Foxe Basin) ice conditions.

Aircraft

A DeHavilland Twin Otter is available on a "when available" basis from Bradley/First Air in Hall Beach. This aircraft can be outfitted with skis and a VLF positioning system which will enable it to land in areas of Foxe Basin where ice conditions permit. Bradley/First Air has on site a competent air and ground crew very experienced in "off strip" landings. These personnel proved to be an asset during site location and relocation.

Locally Available Labour

Many Inuit are available in the village of Hall Beach, who can offer assistance during field operations. Dobrocky SEATECH took advantage of this during the recovery operations and hired a local resident for field assistance, thus reducing the cost of field operations.

Weather

Weather conditions in the Foxe Basin area are typically unpredictable. The weather experienced during the deployment phase was better than usual. Temperatures around -40° were experienced with winds nearly calm. The visibility was normally very good with the exception of occasional sea fog due to open water.

Weather during the recovery operations was typical of "spring" conditions. Temperatures ranged from -40° to -10° and changed very rapidly. Winds blew from both the west and the east with gusts approaching 30 kn. Visibility was excellent (>15 miles) during most of the recovery phase with the exception of periods of snow and blowing snow, when visibility dropped to near zero. Sea fog was not a problem as ice conditions had stabilized.

Between the deployment and recovery periods, up to 1/2 metre of snow had fallen over the entire area. A great deal of snow drifting had occurred in areas which were previously smooth ice.

FOXE BASIN APRIL 1984

Ice Conditions

The ice conditions observed during the recovery phase differed greatly from those observed during deployment. The ice conditions between those sites visited showed a marked increase in stability and coverage. During deployment, the western shoreline of Foxe Basin had, in general, about 6/10 to 8/10 ice coverage, with very large leads running in a north-south orientation. The ice surface was very rough and the floes mobile, hindering aircraft landings. Instruments were deployed in limited areas of landfast ice, generally in sheltered bays.

The only area that exhibited a large amount of landfast stable ice was Steensby Inlet, from Cape Thalbitzer north-east into the Inlet. The entrance to Fury and Hecla Strait was about 2/10 ice covered with new and rafted ice.

During recovery, ice conditions had changed. Ice coverage along the western shoreline had increased to 9/10 with very few small leads running in the same north-south orientation. The ice surface was still very rough and it is doubtful whether aircraft could land in most areas.

Enroute to Station #1, situated at the entrance to Steensby Inlet, a very large polynia was observed. This polynia was about five miles wide over its entire length, and ran from a point a few miles south-west of Cape Thalbitzer in a straight line to a point just north of Hall Beach. The entrance to Fury and Hecla Strait previously noted as having 2/10 ice coverage now appeared to be 10/10, and stable. This polynia was again noted to follow the topographical features southward past Hall Beach into Parry Bay. It was not observed as far south as Station #5, off Cape Jermain.

Although the ice conditions between Prince Charles Island and Cape Dorchester, in the south-east quadrant of Foxe Basin, were not observed during April, it is believed that this region would also present a more stable condition.